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PM Course notes

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Syllabus A: Information, technologies and systems

Syllabus A1. Managing information

Information systems can:

1. Improve processes within organisations
2. Improve processes with suppliers and customers.
3. Capture and generate the information that managers need for planning, control and decision-making purposes
4. Record transactions for evidence and other uses
5. Help make informed decisions
6. Help planning by showing available resources, possible timescales, predicting likely outcomes
7. Help Performance measurement eg. Budget v actual comparisons

Benefits of a good Information System

Basically it gives you a competitive advantage through....

Easier access to Info

Quicker spreading of info

Intranet

These are a cluster of computers can be networked together to form an organisation-wide network.

They are private networks, often used for company newspapers, induction material, online procedure and policy manuals, employee web pages where individuals post details of their activities and progress, and internal databases of the corporate information store.

Wireless Technology

This allows:
(a) Remote working and increased mobility
(b) Increase productivity (because employees can work together wherever they need to)
(c) Reduced costs as the business expands (because it is easier to add new users to a wireless network than to install new cabling)
There are costs involved in setting up the equipment and training required to make use of mobile devices.
Mobile IT devices can expose valuable data to unauthorised people if the proper precautions are not taken to ensure that the devices, and the data they can access, are kept safe.

Generating and distributing Internal Info

Management Reports

Management reports should contain good information and should be communicated via the right channels = **ACCURATE**

- **A**CCURATE
- **C**OMPLETE
- **C**OST/BENEFIT – its cost must be less than the value of the benefits it provides
- **U**NDERSTANDABLE to the manager using it
- **R**ELEVANT and not excessive
- **A**CCESSIBLE via the right channels
- **T**IMELY communicated at the proper time
- **E**ASY TO USE

Controls over generating internal information

Controls have to be in place when generating internal information for routine and ad-hoc reports. Internal information is confidential, and very often, commercially sensitive.

Before starting any report (routine or ad-hoc), a cost/benefit analysis has to be undertaken: what are the costs involved in preparing such a report versus the benefits obtained by having such information?

For routine reports, it is important that the company carries out certain procedures

1. Formats, layouts and definitions used in reports should be consistent so as to avoid misinterpretations and time wastage on amended layouts etc. The writer/s of such report should be specified.

2. Users' requirements should be clearly understood so that the report will be targeted to meet those requirements. Once prepared, the report should be assessed against those requirements.

3. The report must also indicate the actions that users can take on the information presented in such a report.

Ad-hoc reports should only be prepared if the requested information does not already exist in a different format.

Such reports cost money and therefore, the writers of such reports should be given only relevant and up-to-date information. In order to increase the reliability of such reports, the writers should be clearly identified.

Controls over distributing internal information

The organisation should set out a number of controls re the distribution of information. Information should be available to authorised persons and third parties only.

Distribution lists should be prepared, indicating who should receive the reports. Procedure manuals are usually also available indicating the formats of such reports and when routine reports should be issued.

All employees should be required not to divulge confidential information to third parties. This is usually specified in contracts of employment.

The use of email is also very important in distributing information. Emails are usually undesirable for confidential information and long reports.

Information should be physically safeguarded. Reports should be locked in and protected by passwords. Firewalls should also be used to protect data from external access.

Security of Highly Confidential Information

Procedures that may be necessary to ensure security of highly confidential information that is not for external consumption.

Each individual granted access to electronic and/or hard copy data holds a position of trust within the organisation and must preserve the security and confidentiality of the information to which he/she is granted access to.

Therefore, the organisation must ensure that no data, in any format, is divulged to unauthorised third parties.

Confidential information must be stored in such a way as to ensure that only authorised persons can access it. Policies and procedures must be in place for the secure disposal/destruction of confidential information.

How can we ensure the security of highly confidential information that is not for external consumption?

1. **Passwords:** Passwords can be a very good means of control. Each password is allocated suitable access rights. Users must follow good security practices in the selection and use of passwords.

2. **Physical and Logical access control:** Physical access control is concerned with preventing unauthorised persons gaining access to the hardware, e.g. locks, doors etc. Logical access control prevents unauthorised persons from gaining access to data or software.

3. **Database security controls:** These controls are required as, in theory, the database can be accessed by a large number of people. Security risks to database systems include unauthorised access, deletion or damage to the data or programs, leakage of confidential information. Computer security inference controls attempt to prevent users from inferring this information.

4. **Firewalls:** A firewall can be software-based or hardware-based and is used to prevent unauthorised access into company systems.

5. **Encryption:** Encoding messages (or information) in such a way that eavesdroppers or hackers cannot read it, but authorised parties can.

6. **Anti-virus and anti-spyware software:** This software has been developed to counteract computer viruses and spyware. Spyware is software that monitors a user's computer. It can collect any type of data, including personal information, and can change computer settings and install additional software. Hence, anti-spyware software scans the software for any spyware and blocks any software which represents spyware.

7. **Personal data:** Today, countries have introduced the Data Protection Act to safeguard individuals from having their personal information transferred to unauthorised third parties.

Syllabus A2. Information systems and data analytics

Internal and External Sources

Types of Sources

Management information comes from multiple sources. The challenge for a business is to capture and use relevant and reliable information and the benefit of such information must exceed the cost of obtaining this information.

Modern IT systems have reduced these costs significantly but skilled highly-paid staff is required to run these information systems.

Internal Sources

Accounting records are a prime source of internal information. They detail the transactions of the business in the past, which may be used as the basis for planning for the future (e.g. preparing a financial budget or forecast).

Daily books such as sales day book, purchase day book and cashbook can provide useful information to management.

The accounting records are primarily used to record what happens to the financial resources of a business. For example, how cash is obtained and spent; what assets are acquired; what profits or losses are made on the activities of the business.

However, accounting records can provide much more than financial information. For e.g., details of the products manufactured and delivered from a factory can provide useful information about whether quality standards are being met.

Data analysed from customer sales invoices provides a profile of what and to whom products are being sold.

Internal information connected to accounting systems

Most internal information is connected to accounting systems - but is not directly part of them. For e.g.:

1. From the payroll system, records of the people employed by the business (personal details; what they get paid; skills and experience; training records)
2. Data on the costs associated with business processes (e.g. costings for contracts entered into by the business)

3. Data from the production department (e.g. number of machines; capacity; repair record)

4. Data from activities in direct contact with the customer (e.g. analysis of calls received and missed in a call centre)

Internal information is also provided informally. For example, regular meetings of staff and management will result in the communication of relevant information. For e.g. minutes of board meetings may include future strategies on new products and markets.

External Sources

This is information that is obtained from outside the business. Such external information tends to be more relevant to strategic and tactical decisions rather than to operational decisions.

Sources of external information

- Government publications such as monetary and fiscal policies,

- Press releases such as newspapers, technical magazines, journals which provide information about share price, technological developments and information on competitors and their products.

- Banks can provide information on potential customers and on nation markets.

- Financial statements of other businesses provide useful information to the company.

- Correspondence received from suppliers, customers and tax authorities etc.

- Internet websites, social networking sites, forums etc.

- Databases held by public bodies and businesses e.g. providing online information on money market interest rates and foreign exchange rates.

- Data warehouses which contain data from both internal and external sources. They store current as well as historical data and are used for creating trending reports for senior management reporting such as annual and quarterly comparisons.

There are many advantages of using the internet to obtain information: - it offers loads of information which you can acquire efficiently and quickly. It is relatively inexpensive to acquire information from the internet. But the quality of this information cannot be guaranteed. This will be discussed in more detail later on.

Control Purposes

Information for Control Purposes

Both internal and external sources of information are required by management for control purposes.

To control (comparing actual results against the plan), internal information is required. Variance reports are very useful is arriving at control action. For e.g., to identify sales variances, information can be obtained internally about the sales volumes over different time periods.

For example, information about stock (inventory) levels within the organisation helps management identify ways how to increase the sales of slow moving lines of stock.

A reduction in the sales of a product will help management identify the reasons why this has occurred: has competition introduced a similar product? Has competition reduced the prices of rival products? Were there any quality issues regarding our product?

External information is useful for benchmarking (e.g. competitive benchmarking - comparisons with competitors in the business sector).

Direct Data Capture & Process Costs

Costs of Obtaining Internal Information

The most expensive cost of producing information is probably the cost of wages. People are required to collect data, input data into the system, process the data and then output the resulting information .

An organisation can divide the costs of collecting, processing and producing internal information into three types:

- Direct data capture costs
- Processing costs
- Indirect costs

Direct Data Capture Costs

Direct data capture is a type of data input in which there is no data entry. Data is input into the computer through a reader. It is collected for a particular purpose (e.g. barcodes being read at a supermarket so that the product can be identified or account details being read directly from the chip embedded in the credit card .)

There are obviously costs related to direct data capture, e.g. in linking the different barcodes to the different products.

Processing Costs

This would include costs relating to processing and analysing the information, e.g. costs relating to input data and to analyse that data to get more useful information.

Indirect Costs of Producing Information

Indirect Costs

Information can be used inefficiently. For example,

- Reduced quality of information, due to information overload (sometimes information is collected but not required);

- Poor decision making, due to information overload;

- Too many areas to focus on – so issues are not followed up;

- Focus on the wrong things – i.e. only on those business areas and targets that are easy to measure and report on.

Costs of Obtaining External Information

There are five types of costs

1. Direct search costs, for e.g. subscription costs to databases, journals, etc; costs of marketing research surveys (an example of primary data)

2. Indirect access costs: time spent on finding useful information for a particular project, etc.

3. Management costs: the costs of recording, processing and disseminating information. As already discussed, sometimes time is wasted as a result of information overload or duplication of information.

4. Infrastructure costs: the use of the internet requires installation of networks, servers etc.

5. Time-theft: lost and wasted time even through the unauthorised use of internet facilities.

Types of Information Systems

Performance management information systems

Performance management information systems are an integral part in producing the information required by management accountants to enable performance measurement.

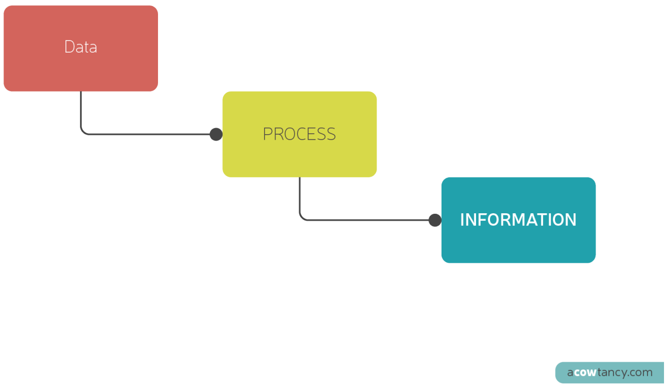
First, let's have a look at the difference between data and information.

Data consists of the raw facts and figures, e.g. numbers, letters and transactions, that have not yet been processed into a form suitable to make decisions.

Information is summarised data, or otherwise manipulated data, that is useful for decision-making. The data has been processed and it can be used to improve the quality of decisions taken. Hence, information is "meaningful data".

A **data processing system** records the day-to-day transactions taking place within an organisation. It records, analyses, sorts, summarises, calculates and stores data.

An information system uses this data and turns it into useful information required to run the organisation.



Why do managers need information?

Managers need information to formulate plans and take decisions. If actual results diverge from plans, control action is required.

Levels of Planning and Control within an Organisation

There are three levels of planning and control within an organisation: strategic, tactical and operational levels.

level of control	**activity**
strategic planning	plans the long-term strategies of the organisation e.g. investment decisions
management control	medium term planning and control decisions. responsible with implementing decisions of strategic managers. ensures that the organisation's objectives are achieved by using resources efficiently and effectively.
operational control	concerned with controlling the day-to-day operations of the organisation. short term decisions

Management accounting information

1. **Strategic Planning, Control and Decision-Making**

   For strategic planning, management accounting systems require information from both internal and external sources. They require information from many areas of the business and help to ensure goal congruence.

   Due to the long-term nature of such planning and the element of uncertainty in the long term, management accounting information should include risk and uncertainty analysis. Discounted cash flow techniques are expected to be used in project evaluation.

   Strategic Management Accounting

   Strategic Management Accounting has been defined as "a form of management accounting in which emphasis is placed on information which relates to factors external to the firm, as well as non-financial information and internally generated information."

Whereas traditional management accounting fails to assess competition(inward-looking) and ignores the impact of other activities, strategic management accounting is the merging of strategic business objectives with management accounting information to provide a **forward looking** model that assists management in making business decisions.
Unlike traditional management accounting -- which has an internal focus – strategic management accounting evaluates **external information** regarding trends in costs, prices, market share and cash flow, and their impacts on resources, to determine the appropriate tactical response.

The strategic element of management accounting requires enhanced information about competitors, suppliers and technologies.

Illustration of Strategic Management Accounting

According to research from McGraw-Hill, Tesco determined that the company's primary fixed asset base was its stores. Based on this factor management created strategic partnerships with construction companies to lower costs and maintain quality.

In addition, Tesco monitored competitor product pricing to reduce customer prices and gain market share. Tesco also enhanced its technology by offering store cards that track customer purchase patterns.

2. Management Control

Whereas strategic planning involves setting objectives and targets, management control is concerned with implementing decisions of strategic managers and ensuring that the organisation's objectives are achieved by using resources efficiently and effectively.

Tactical level managers require information in much more summarised form. Much of this information will be given to the tactical manager by the operational managers in the form of reports, hence they are primarily generated internally e.g. productivity measurements, manning levels.

This information is usually prepared on a regular basis such as on a weekly or monthly basis. Tactical information is very often quantitative and expressed in monetary terms, e.g. variance analysis reports, cash flow forecasts, profit results for a particular department.

Tactical planning and management control decisions or strategic planning?

- Launch a new product – strategic plan
- Preparing the functional budgets for next year – management control planning

- Reducing employee turnover and operational costs in the next 12 months – management control decision

- The board of directors take a decision to increase market share by 10% for, at least, 5 years is a strategic plan. How to achieve that increase falls under management control decisions (tactical planning) – e.g. the senior sales manager is planning advertising and marketing campaigns to increase the market share by 10% next year.
  Management control is usually carried out regularly by comparing the planning activities with the outcomes, e.g. budget targets are compared with actual and action taken to remove any resulting variances.
  If circumstances have changed, the budget will be altered to obtain a better picture of the company.

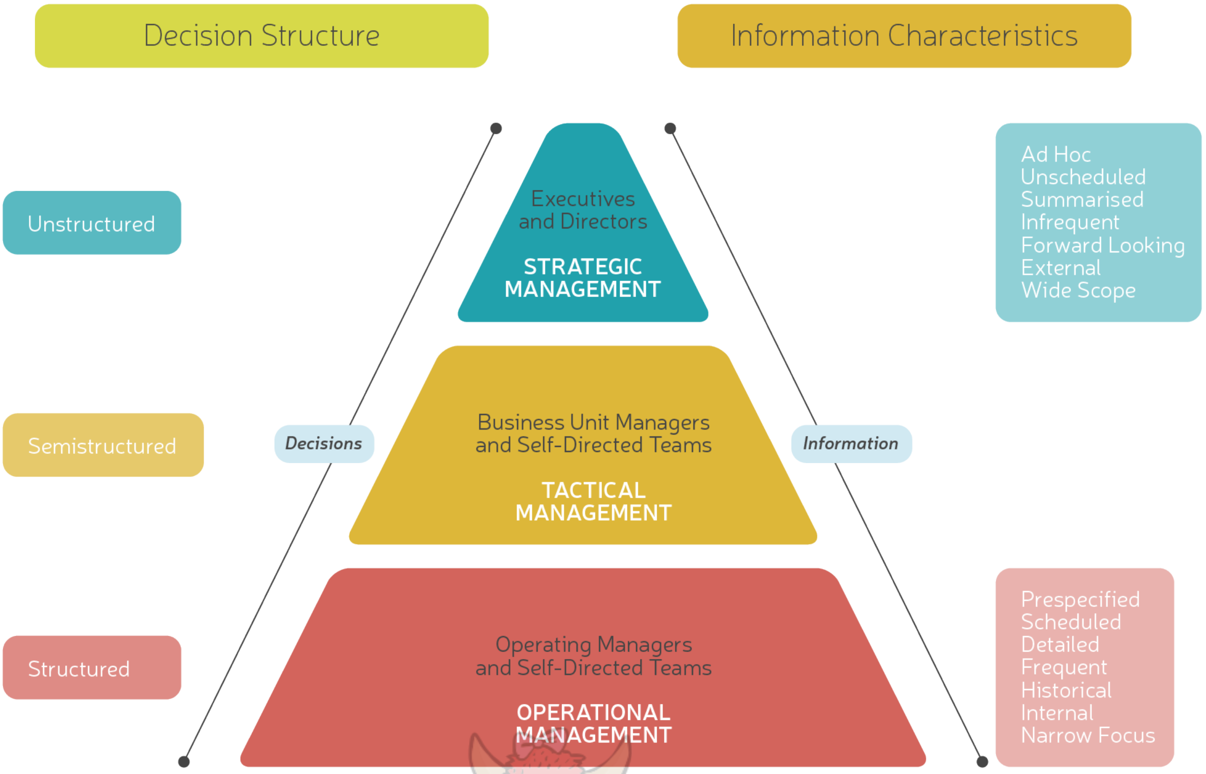
3. Operational Control

The operational level of management is primarily concerned with making sure that the day-to-day tasks are carried out efficiently and effectively. E.g. the sales manager of the Buskett branch has set weekly sales targets for each of his sales representatives. This is an example of an operational control decision.

Most of the information required in operational control decisions is obtained from internal sources and this must be detailed and precise. E.g. information required to determine how many operative staff will be required to complete a task.

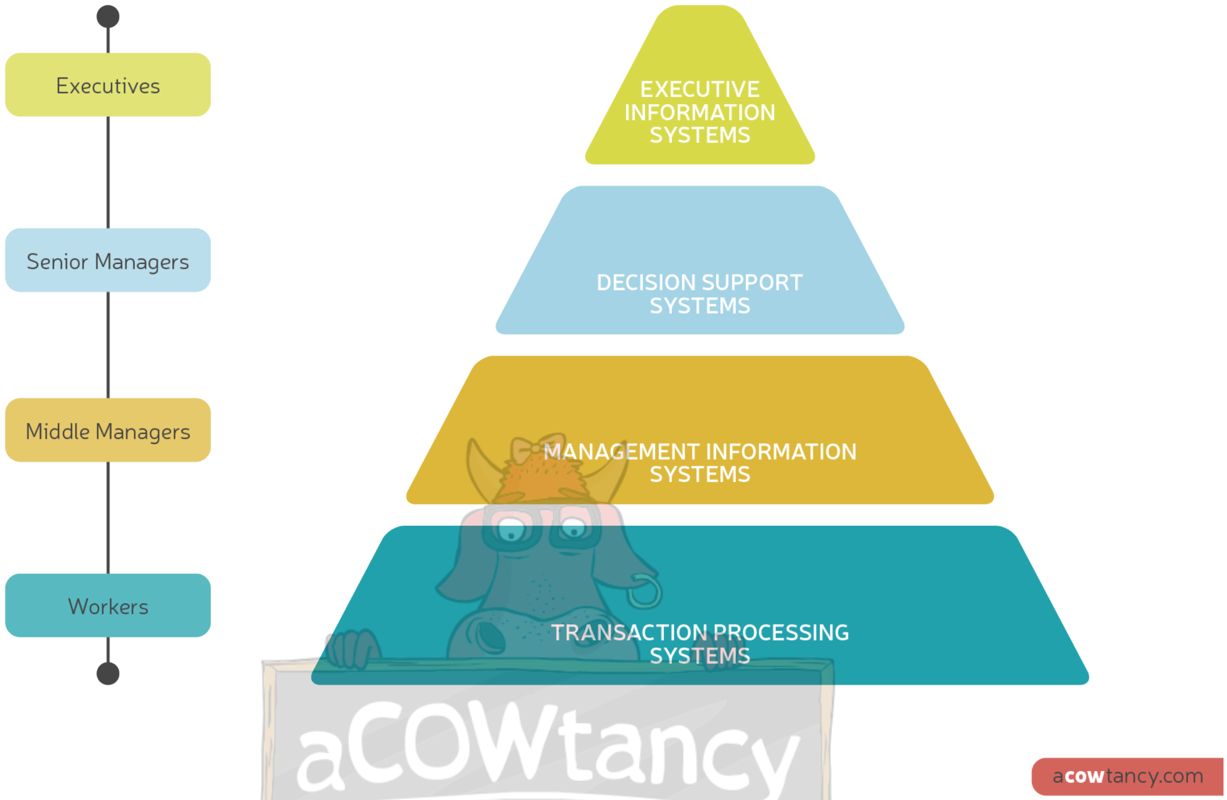
In fact, operational information is expected to be more detailed than tactical information, which in turn, is expected to be more detailed than strategic information. Unlike tactical information, operational information is often expressed in units, hours, kgs, etc.

The following figure shows the information characteristics at the different management levels for planning, control and decision making.


Decision Structure
Information Characteristics
Unstructured
Semistructured
Structured
Decisions
Information
Executives and Directors
STRATEGIC MANAGEMENT
Business Unit Managers and Self-Directed Teams
TACTICAL MANAGEMENT
Operating Managers and Self-Directed Teams
OPERATIONAL MANAGEMENT
Ad Hoc
Unscheduled
Summarised
Infrequent
Forward Looking
External
Wide Scope
Prespecified
Scheduled
Detailed
Frequent
Historical
Internal
Narrow Focus

Main Characteristics

Transaction processing systems (TPS)


Executives
Senior Managers
Middle Managers
Workers
EXECUTIVE INFORMATION SYSTEMS
DECISION SUPPORT SYSTEMS
MANAGEMENT INFORMATION SYSTEMS
TRANSACTION PROCESSING SYSTEMS
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A transaction processing system is a computerised system that performs and records the daily, routine transactions necessary to conduct the business. It collect, stores, modifies and retrieves the transactions of an organisation.

TPS are built to handle regular, high volume, data processing needs, e.g. invoicing, order processing. They tend to be inflexible (every transaction processed in the same way) and they are often developed with strong emphasis on efficiency and reliability to save time and money. TPS are mainly used by the operational managers to make day-to-day decisions.

Two Types of Transaction Processing Systems

1. Batch transaction processing collects transaction data as a group, with the actual updating of the database later when it is scheduled or there is enough data.

   E.g. the way that credit card companies process billing. The customer does not receive a bill for each separate credit card purchase but one monthly bill for all of that month's purchases.

   The bill is created through batch processing, where all of the data is collected and held until the bill is processed as a batch at the end of the billing cycle.

   Another example is the clearing of presented cheques.

2. Real time transaction processing is the immediate processing of data. A number of users can perform transactions at the same time. Access to a central online database is required. Examples include reservation systems for flights, point of sale terminal and library loans.

Management Information Systems (MIS)

A management information system provides managers with information on the basis of which they can make better, more informed decisions and exercise oversight and control of the parts of the organisations they are responsible for.

It collates information from the TPS and provides periodic reports to middle managers to control the business.

For example:

1. Data on goods sold is collected by the data processing system, using a barcode scanner and an EPOS system, and stored on a computer file;

2. An operational information system then reads this data and produces a list of items that need reordering;

3. A management information system may analyse the sales data to highlight sales trends and use this information to plan a new marketing campaign, adjust price levels or plan an increase or reduction in production facilities.

Decision support systems (DSS)

Decision support systems offer enhanced ability to manipulate the data, model it, and allow a user (decision maker) to explore alternative scenarios. This Information system helps the decision maker to make his own informed decisions and exercise his own judgement.

Examples of DSS in accounting include:

- Cost accounting system
- Capital budgeting system
- Budget variance analysis system
- General decision support system

Executive information systems (EIS)

An executive information system provides information to senior managers and executives who need a broad mix of internal and external information to support strategic decisions. It draws data from the MIS and also includes data from external sources, for e.g. competition.

EIS are designed to help senior managers get information quickly and effectively. They include data analysis (e.g. interactive graphical displays) and modelling tools, e.g. what-if-analysis.

Enterprise resource planning system (ERP system)

Enterprise resource planning systems integrate internal and external management information across an entire organisation, e.g. finance/accounting, manufacturing, sales and service, purchasing and human resources are integrated into one single system using an integrated software application.

The purpose of ERP system is to facilitate the flow of information between all business functions inside the boundaries of the organisation and manage the connections to outside stakeholders.

Where an ERP system is implemented, this has had a significant impact on the work of management accountants.

1. Less time spent on data collection
2. Less time spent on data analysis and routine report generation
3. More involvement in business decision-making

4. More focus on internal reporting, e.g. performance measures and control issues
5. More focus on the external environment, e.g. benchmarking
6. Focus on forward looking rather than historical analysis
7. Need for improved communication skills

Big Data

Big Data is the collection and analysis of a large amount of data

It then helps find trends and understand customer needs

Benefits:

Conversion to useful information

Gaining competitive advantage

Driving innovation

The 5 V's

Big data has a role to play in information management

Volume

There's just more data available nowadays

For example, data captured from social media.

Velocity

You can get data much quicker

Variety

Modern data takes many different forms - Video, audio, written etc

(Structured data is often numerical data whereas unstructured data may be in the format of email or video)

Veracity

This refers to truthfulness. Data needs to be reliable and truthful.

Hidden biases in the data can be a problem too (eg Overstating demand whereas in truth it's not as high as we like to think it could be)

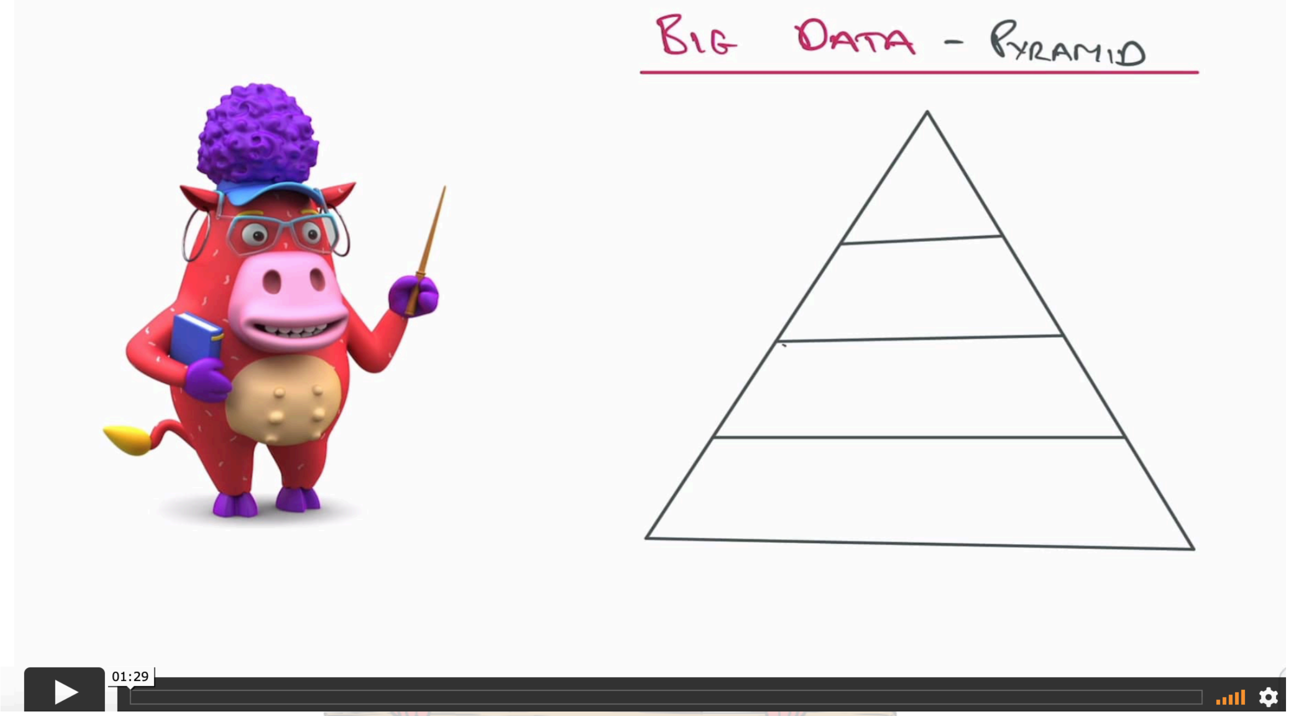
Value

This refers to data's usefulness to the business.

Big data is only valuable if its insights are valuable (help decision making)

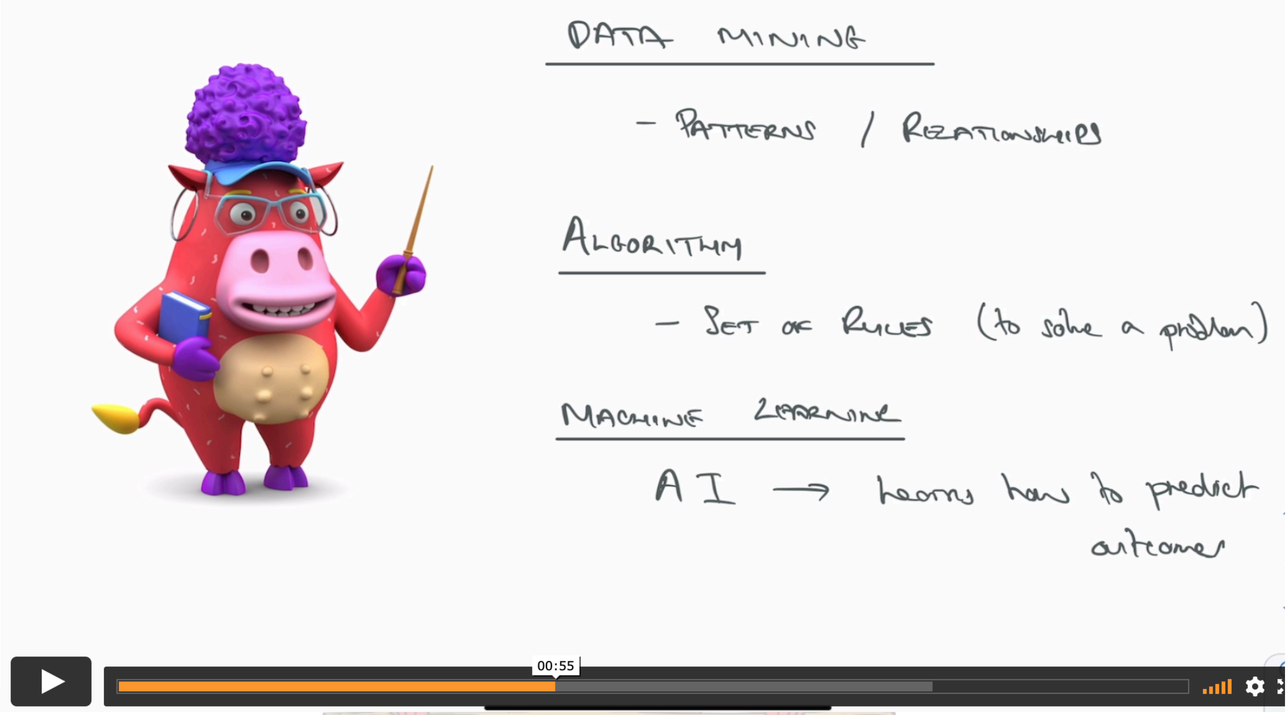
Big Data Pyramid

You can watch the video HERE



Data Mining, Algorithms and Machine Learning

You can watch the video HERE



DATA MINING

- PATTERNS / RELATIONSHIPS

ALGORITHM

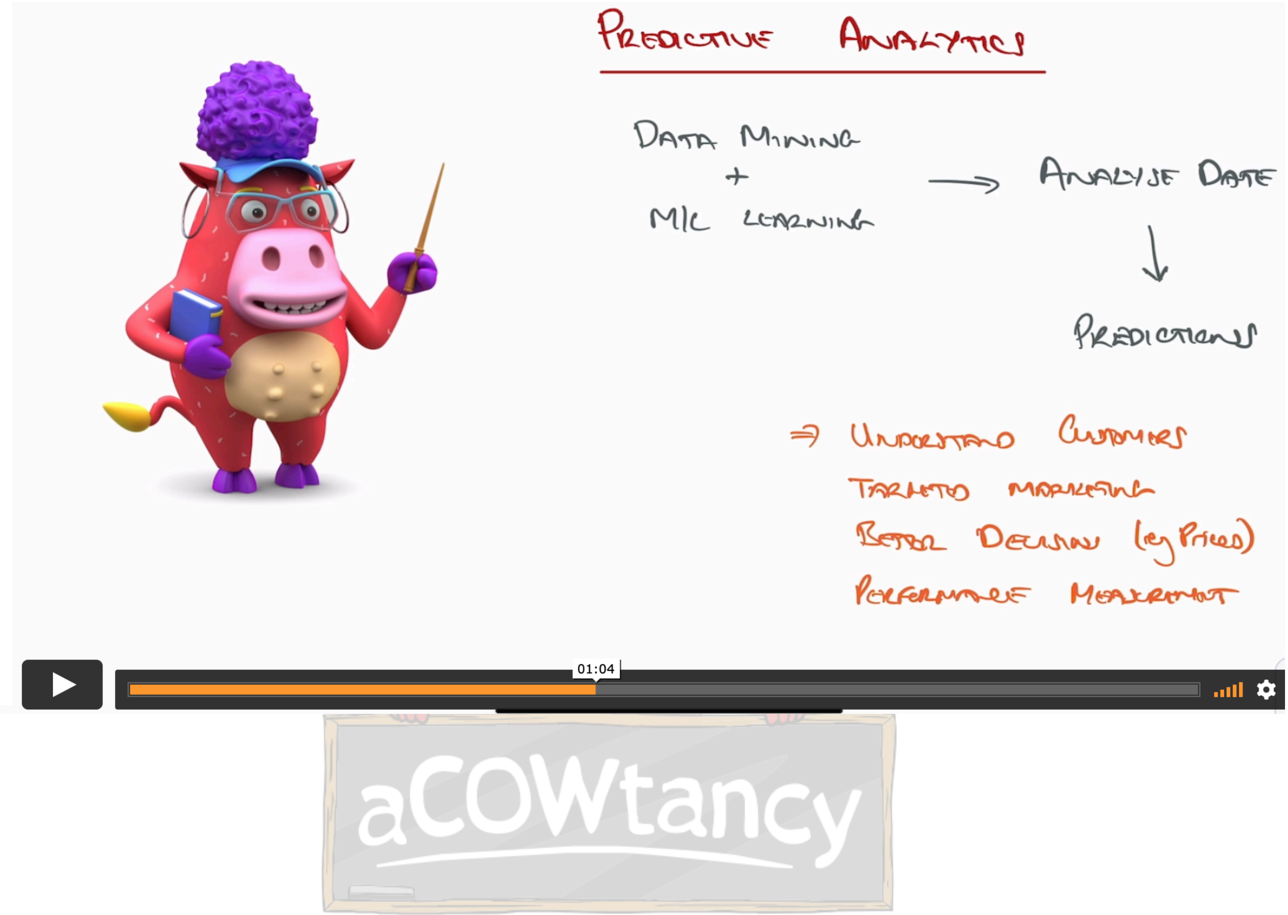
- SET OF RULES (to solve a problem)

MACHINE LEARNING

AI → learns how to predict outcomes

Predictive Analytics & Risks

You can watch the video HERE



PREDICTIVE ANALYTICS

DATA MINING
+
M/L LEARNING → ANALYSE DATE
↓
PREDICTIONS

⇒ UNDERSTAND CUSTOMERS
TARGETED MARKETING
BETTER DECISION (eg PRICES)
PERFORMANCE MEASUREMENT

Syllabus B: Specialist Cost And Management Accounting Techniques

Syllabus B1. Activity Based Costing

Introduction to ABC

Costing methods

In earlier studies, we have discussed two traditional costing methods:

- absorption costing and
- marginal costing.

What was the main difference?

In absorption costing, both fixed and variable production overheads are charged to production.

In marginal costing, only variable production overheads are charged to production.

Absorption Costing

In absorption costing, overheads were allocated to products using a three-stage procedure

Stage 1:
Overheads are allocated or apportioned to cost centres (usually production and service departments) using suitable basis

Stage 2:
Service centre costs are reapportioned to production centres

Stage 3:
Overheads are absorbed into units of production using an overhead absorption rate

How to find the OAR

OAR = Budgeted overheads / Budgeted activity level

The budgeted activity level is usually taken as direct labour hours, machine hours or number of units.

Illustration 1

A company uses an overhead absorption rate of $3.50 per machine hour, based on 32,000 budgeted machine hours for the period.

During the same period, the actual total overhead expenditure amounted to $108,875 and 30,000 machine hours were recorded on actual production.

By how much was the total overhead under or over absorbed for the period?

Overheads absorbed (30,000 X 3.50)	$105,000
Overheads incurred	$108,875
Under-absorbed	$3,875

Illustration 2

Budgeted overheads $70,500

Products	X	Y	Z
Budgeted units	15,000	8,000	2,000
Direct Labour(hours)	1	3	4

$$\text{OAR} = \frac{\text{Budgeted overheads}}{\text{Total labour hours}} = \frac{\$70{,}500}{(15000 \times 1) + (8000 \times 3) + (2000 \times 4)}$$

$$= \frac{\$70{,}500}{47{,}000}$$

$$= \$1.50/\text{labour hour}$$

The overhead cost charged per unit is:

Products	X	Y	Z
Overhead cost	($1.5 x 1hr)	($1.5 x 3hr)	($1.5 x 4hr)
	$1.50	$4.50	$ 6.00

If either or both of the actual overhead cost or activity volume differ from budget, the use of this rate is likely to lead to what is known as under-absorption or over-absorption of overheads.

Illustration 3

Budgeted overheads	$70,500		OAR = $1.50/labourhr
Budgeted labour hours	47,000		
Actual labour hours	50,000		
Actual overheads	$85,000		
Overheads absorbed = 50,000 x $1.50 =		75,000	
Overheads incurred	=	85,000	
Overheads Under absorbed	=	10,000	

Finding the cost per unit – Absorption Costing

Cost Card

	$
Direct Materials	15.00
Direct Labour	18.00
Prime Cost	33.00
Variable Overheads	2.00
Fixed Overheads	3.00
Full Production Cost	38.00

Marginal Costing

Marginal costing is the accounting system in which variable costs are charged to cost units and fixed costs of the period are written off in full against the aggregate contribution.

Contribution is the difference between sales value and the variable cost of sales.

Contribution = Selling price – ALL variable costs (both production and non-production variable costs)

Total Contribution = contribution per unit x sales volume

Profit = Total contribution – Fixed costs

Find the cost per unit – Marginal Costing

Cost Card

Direct Materials	15.00
Direct Labour	18.00
Prime Cost	33.00
Variable Overheads	2.00
Marginal Production Cost	35.00

Absorption vs Marginal Costing Profit

Reported profit figures using marginal costing or absorption costing will differ if there is **any change in the level of inventories** in the period. If production is equal to sales, there will be no difference in calculated profits using the costing methods.

If inventory levels increase, absorption costing gives the higher profit
If inventory levels decrease, marginal costing gives the higher profit
If inventory levels are constant, both methods give the same profit

Profits generated using absorption & marginal costing can also be reconciled as follows:

Difference in the profit = change in inventory in units x FOAR per unit

Illustration 4

The following budgeted information relates to a manufacturing company for next period:

	Units		$
Production	14,000	Fixed production costs	63,000
Sales	12,000		

The normal level of activity is 14,000 units per period.

Using absorption costing the profit for next period has been calculated as $36,000.

What would the profit for next period be using marginal costing?

Difference in profit = change in inventory x FOAR/unit
= 2,000 x (63,000/14,000)
= 2,000 x $4.50
= $9,000

Inventories are increasing, hence absorption costing profit is higher.

Absorption costing profit	36,000
Difference in profits	9,000
Marginal costing profits	27,000

Identifying Cost Drivers

ABC is an alternative costing method to absorption costing

Absorption costing focuses on the product in the costing process.

Costs are traced to the product because each product item is assumed to consume the resources.

However, in many modern-manufacturing operations, overheads are not homogeneous in terms of being primarily influenced by volume.

In fact, the majority of overheads in a modern manufacturing operation are largely unaffected by changes in production volume.

ABC links overhead costs to the products or services that cause them by absorbing overhead costs on the basis of activities that ‘drive’ costs (cost drivers) rather than on the basis of production volume.

In ABC, activities are the focus of the costing process.

Costs are traced from activities to products based on the products demands for these activities during the production process.

Activities may include equipment preparation, order handling, quality control.

'Cost driver' is the term used for an activity which influences the amount of total expenditure on a particular cost.

For some costs, volume will be the cost driver, but for many other costs, volume will be a very poor indicator.

By grouping costs on the basis of cost drivers, we will be able to both manage costs better (by managing the activity) and to calculate the cost of production.

Examples of cost drivers would be:

1. Ordering costs – no. of orders
2. Set-up costs – no. of set-ups
3. Packing costs – no. of packing orders

Calculating costs per driver and per unit

Steps in establishing and applying ABC

There are 5 main steps in establishing and applying ABC:

1. Identify activities that consume resources and incur overhead costs.

2. Allocate overhead costs to the activities that incur them.

3. Determine the cost driver for each activity or cost pool.
   Each group of costs which are influenced by a particular cost driver is referred to as a 'cost pool'.

4. Collect data about actual activity for the cost driver in each cost pool

5. Calculate the overhead cost of products or services.
   This is done by calculating an overhead cost per unit of the cost driver.
   Overhead costs are then charged to products or services on the basis of activities used for each product or service.

Example

The following example looks at the different activities within a company, their cost and their cost driver.

The cost per driver is found by dividing the total cost of the activity by the quantity of the cost drivers.

Overhead costs are then charged to products or services on the basis of activities used for each product or service.

Activity	**Cost Pool ($)**	**Cost Driver Volume**	**Cost / Driver ($)**
process set-up	37,500	100 set ups	375 / set up
material procurement	9,000	50 purchase orders	180 / purchase order
maintenance	10,000	10 maintenance plans	1,000 / maintenance plan
material handling	22,500	2,000 material movements	11.25 / material movement
quality control	20,500	250 inspections	82 / inspection
order processing	13,000	300 customers	43.33 / customer
	112,500		

Comparing ABC and Traditional Methods of Overhead Absorption

Traditional absorption costing

Traditional absorption costing assumes that overhead expenditure is related to direct labour hours, machine hours or production units.

However, this assumption is no longer reliable in many companies.

Using ABC to allocate overhead costs to products will lead to very different values of overheads allocated per unit.

The Advantages of ABC

1. More accurate cost information is obtained. It identifies ways of reducing overhead costs in the longer-term.

   This will enable managers to make better decisions, particularly in respect of pricing and marketing activities.

2. In absorption costing, as the profitability of a product would be overstated, the company's marketing effort is likely to be directed towards maximising the sale of this product, with a lesser emphasis on the other products.

   In addition, as the resulting selling price will be less than is required to fully recover overheads and yield a satisfactory profit, the market will perceive the product to be particularly attractive.

3. It provides much better insights into what drives overhead costs. ABC recognises that overhead costs are not all related to volume.

   It also identifies activities and costs that do not add value.

4. ABC can be applied to all overhead costs, not just production overheads.

Disadvantages of ABC

ABC may not be universally beneficial. There are four major issues to be considered:

1. **Cost vs benefit**

   The need to analyse costs on a radically different basis will require resources, which will lead to additional costs. Clearly the benefits which will be obtained must exceed these costs.

   In general terms, an organisation which has little competition, a stable and standardised product range and for which overheads represent a small proportion of total cost, will not benefit from the introduction of ABC.

2. **Need for informed application**

   While ABC is likely to provide better information for decision makers, it must still be applied with care. ABC is not fully understood by many managers and therefore is not fully accepted as a means of cost control.

3. **Difficulty in identifying cost drivers**

   In a practical context, there are frequently difficulties in identifying the appropriate drivers. ABC costs are based on assumptions and simplifications. The choice of both activities and cost driver.

4. **Lack of appropriate accounting records**

   ABC needs a new set of accounting records, this is often not immediately available and therefore resistance to change is common.

   The setting up of new cost pools is needed which is time-consuming.

Service organisations

Five key characteristics of service organisations are

- Simultaneity/spontaneity (production and consumption of the service coinciding)
- Perishability (the inability to store the service
- Heterogeneity (variability in the standard of performance of the provision of the service)
- Intangibility (of what is provided to and valued by individual customers)
- No transfer of ownership

ABC can be effectively applied to service organisations. Indeed, the fact that for most service organisations, indirect costs will represent the major proportion of total cost means that the technique is of particular relevance to service organisations.

Syllabus B2. Target Costing

Deriving a Target Cost

Deriving a target cost in manufacturing and service industries

A target cost is a cost estimate derived by subtracting a desired profit margin from a competitive market price.

This market price is determined based on the expected price to be paid by the market to achieve a certain market share and sales volume.

The required profit margin is then deducted from the anticipated selling price to arrive at the target product cost.

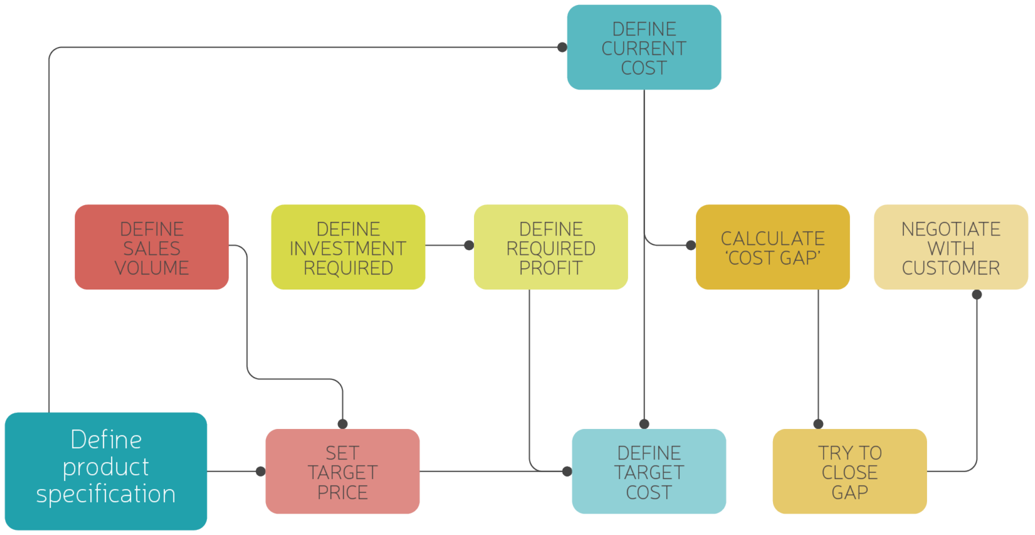
A product of acceptable quality is then designed within that cost.

The main focus of target costing is not finding what a new product does cost but what it should or needs to cost.

The firm can then focus on the costs which can be reduced to achieve the target cost.

Target costing is used by such companies as Sony, Toyota and Swatch.

THE TARGET COST-SETTING PROCESS



acowtancy.com

Steps in target costing

1. Target costing begins by specifying a product an organisation wishes to sell.

   This will involve extensive customer analysis, considering which features customers value and which they do not.

   Ideally only those features valued by customers will be included in the product design.

2. The price at which the product can be sold at is then considered.

   This will take in to account the competitors' products and the market conditions expected at the time that the product will be launched.

   Hence a heavy emphasis is placed on external analysis before any consideration is made of the internal cost of the product.

3. From the above price a desired margin is deducted.

   This can be a gross or a net margin.

4. This leaves the cost target.

   An organisation will need to meet this target if their desired margin is to be met.

5. Costs for the product are then calculated and compared to the cost target.

   If it appears that this cost cannot be achieved then the difference (shortfall) is called a cost gap.

   This gap would have to be closed, by some form of cost reduction (for e.g. value engineering), while satisfying the needs of customers.

6. Before going ahead with the project, the company may hold negotiations with customers.

Illustration 1

Targeted selling price - $20
Gross profit margin - 20%

	$	
Target cost :		
Selling Price	20	
Less margin	(4)	(20% of $20)
Target Cost	16	

Target Costing in Service Industries

The difficulties of using target costing in service industries

Target costing was introduced by major Japanese manufacturing companies for use when:

1. a new product was to be designed to meet the target cost
2. a substantial part of the production cost consisted of bought-in materials

Four key characteristics of service organisations are:

- Simultaneity/spontaneity (production and consumption of the service coinciding);
- Perishability (the inability to store the service);
- Heterogeneity (variability in the standard of performance of the provision of the service);
- Intangibility (of what is provided to and valued by individual customers).
- No transfer of ownership.

Hence, although target costing can be used in service industries, it may face a number of problems:

1. it is very difficult to determine a market-driven price for services provided
2. the introduction of new services occurs far less frequently than in a manufacturing company.
3. the major cost in the service industry is salaries. Bought-in materials are usually low when compared to salaries. It is very difficult to reduce the cost of salaries!

Closing a Target Cost Gap

Suggest how a target cost gap might be closed

Where a gap exists between the current estimated cost levels and the target cost, it is essential that this gap be closed.

Efforts to close a target cost gap are most likely to be successful at the design stage.

It is far easier to ‘design out’ cost during the pre-production phase than to ‘control out’ cost during the production phase.

Ways to reduce a cost gap

1. Review the product’s features.

2. Remove features that add to cost but do not significantly add value to the product when viewed by the customer (non-value-added activities).

   This should reduce cost but not the achievable selling price (value engineering / value analysis).

3. Team approach - cost reduction works best when a team approach is adopted.

   The company should bring together members of the marketing, design, assembly and distribution teams to allow discussion of methods to reduce costs.

   Open discussion and brainstorming are useful approaches here.

4. Review the whole supplier chain - each step in the supply chain should be reviewed, possibly with the aid of staff questionnaires, to identify areas of likely cost savings.

   For example, the questionnaire might ask ‘are there more than five potential suppliers for this component?’ Clearly a ‘yes’ response to this question will mean that there is the potential for tendering or price competition.

5. Efficiency improvements should also be possible by reducing waste or idle time that might exist.

   Where possible, standardised components should be used in the design.

   Productivity gains may be possible by changing working practices or by de-skilling the process.

   Automation is increasingly common in assembly and manufacturing.

Syllabus B3. Life-cycle Costing

Identifying the Costs at different stages of the Life Cycle

Life-cycle costing

Life-cycle costing tracks and accumulates the **actual costs and revenues** attributable to each product **from inception to abandonment**.

It enables a product's true profitability to be determined at the end of the economic life.

Traditional cost accounting systems do not accumulate costs over a product's entire life but focus instead on (normally) twelve month accounting periods. As a result the total profitability of a product over its entire life becomes difficult to determine.

As mentioned in the previous chapter, target costing places great emphasis on controlling any of the costs that relate to any part of the product's life.

Every product goes through a life cycle.

1. ***Development***.

   The product has a research and development stage where costs are incurred but no revenue is generated.

   During this stage, a high level of setup costs will be incurred, including research and development, product design and building of production facilities.

2. ***Introduction***.

   The product is introduced to the market. Potential customers will be unaware of the product or service, and the organisation may have to spend further on advertising to bring the product or service to the attention of the market.

   Therefore, this stage will involve extensive marketing and promotion costs. High prices may be changed to recoup these high development costs.

3. ***Growth***.
   The product gains a bigger market as demand builds up. Sales revenues increase and the product begins to make a profit. Marketing and promotion will continue through this stage.

   Unit costs tend to fall as fixed costs are recovered over greater volumes. Competition also increases and the company may need to reduce prices to remain competitive.

4. ***Maturity***.

   Eventually, the growth in demand for the product will slow down and it will enter a period of relative maturity.

   It will continue to be profitable. However, price competition and product differentiation will start to erode profitability.

   The product may be modified or improved, as a means of sustaining its demand.

5. ***Decline***.

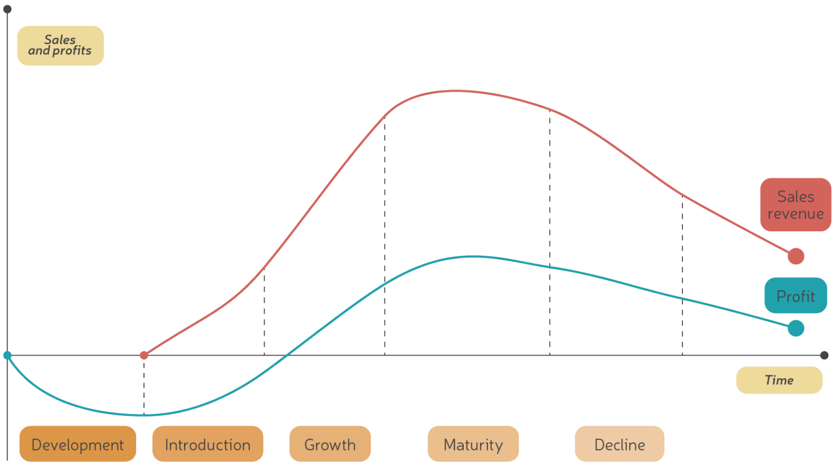
   At some stage, the market will have bought enough of the product and it will therefore reach 'saturation point'.

   Demand will start to fall and prices will also fall. Eventually it will become a loss maker and this is the time when the organisation should decide to stop selling the product or service.

   During this stage, the costs involved would be environmental clean-up, disposal and decommissioning.

   Meanwhile, a replacement product will need to have been developed, incurring new levels of research and development and other setup costs.

The level of sales and profits earned over a life cycle can be illustrated diagrammatically as follows.



Benefits of Life Cycle Costing

The benefits of product life cycle costing are summarised as follows:

1. **All costs** (production and non production) will be traced to individual products over their complete life cycles and hence individual product profitability can be more accurately measured.

2. The product life cycle costing results in **earlier** actions to generate revenue or to lower costs than otherwise might be considered.

3. **Better decisions** should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.

4. Product life cycle thinking can **promote long-term rewarding** in contrast to short-term profitability rewarding.

5. It helps management to **understand the cost consequences** of developing and making a product and to identify areas in which **cost reduction efforts** are likely to be most effective. Very often, 90% of the product's life-cycle costs are determined by decisions made in the development stage. Therefore, it is important to focus on these costs before the product enters the market.

6. Identifying the costs incurred during the different stages of a product's life cycle provides an insight into **understanding and managing the total costs incurred** throughout its life cycle. Non production costs will become more visible and the potential for their control is increased.

7. More accurate feedback on the success or failure of new products will be available.

To maximise a product's return over its lifecycle, a number of factors need to be considered:

- **Design costs**: - since approximately 90% of a product's costs are often incurred at the design and development stages of its life, it is absolutely important that design teams work as part of a cross-functional team to minimise costs over the whole life cycle.

- **Minimise the time to market**: - since competition is harsh, it is vital to get any new product into the marketplace as quickly as possible. and make a profit before competition increases.

- **Maximise the length of the life cycle itself**: - Generally, the longer the life cycle, the greater the profit that will be generated. How can the life cycle be maximised?

    a. *Get the product to the market as quickly as possible*

    b. *Find other uses or markets for the product*

    c. *Market skimming (introducing the product at a high price) will prolong life and maximise the revenue over the product's life.*

- **Minimise break-even time**: - The quicker costs are covered, the more funds the company will have to develop further products.

Syllabus B4. Throughput Accounting

Calculating and Interpreting a TPAR

What is throughput?

Throughput is the rate of converting raw materials and purchased components into products sold to customers.

In money terms, it is the extra money that is made for an organisation from selling its products.

Throughput = Revenue – Raw material cost

What is throughput accounting?

Throughput accounting (TA) is an approach to accounting which is largely in sympathy with the JIT philosophy.

The following are the main concepts in throughput accounting

1. In the short run, most costs in the factory (with the exception of materials costs) are **fixed**.

   These fixed costs include direct labour.

   These fixed costs are called **Total Factory Costs** (TFC) (operating expenses).

2. In a JIT environment, the ideal inventory level is zero.

   Products should not be made unless a customer has ordered them.

   Work in progress should be valued at **material cost only** until the output is eventually sold, so that no value will be added and no profit earned until the sale takes place.

3. Profitability is determined by the rate at which sales are made and, in a JIT environment, this depends on how quickly goods can be produced to satisfy customer orders.

Since the goal of a profit-orientated organisation is to make money, inventory must be sold for that goal to be achieved.

Traditional Cost Accounting versus Throughput Accounting Ratio

Conventional cost accounting	**Throughput accounting**
1. Inventory is an asset	Inventory is not an asset. it is a result of unsynchronised manufacturing and is a barrier to making profit.
2. Costs can be classified either as direct or indirect	Such classifications are no longer useful.
3. Product profitability can be determined by deducting a product cost from selling price.	Profitability is determined by the rate at which money is earned.
4. Profit can be inceased by reducing cost elements.	Profit is a function of material cost, total factory cost and throughput.

Marginal costing and throughput accounting both determine a contribution by calculating the difference between sales revenue and variable costs.

However this contribution figure will be higher under throughput accounting since only material costs are recognised as being variable costs.

Under marginal costing, direct labour costs and certain overhead costs will also be deducted from sales revenues in order to calculate contribution.

Throughput accounting regards such costs as fixed and this is true insofar as they cannot be avoided in the ‘immediate’ sense.

Illustration 1

	x	y
sales revenue	25	30
material cost	5	8
labour cost (@ $3/hr)	3	6
variable overheads	2	2
fixed overheads	1	4
max demand	10,000	15,000

How do we calculate contribution under Marginal costing?

	x	**x**	**y**	**y**
	$	**$**	**$**	**$**
sales revenue		25		30
less variable costs				
material	5		8	
labour	3		6	
variable cost	2	10	2	16
	----	----	----	----
contribution / unit		15		14

How do we calculate Throughput?

	x	y
	$	$
sales revenue	25	30
less material	5	8
	----	----
return / unit	20	22

Throughput accounting and the theory of constraints

The theory of constraints is applied within an organisation by following ‘the five focusing steps’ – a tool which was developed to help organisations deal with constraints.

1. **Identify the system’s bottlenecks**

2. **Decide how to exploit the system’s bottlenecks**

   This involves making sure that the bottleneck resource is actively being used as much as possible and is producing as many units as possible.

3. **Subordinate everything else to the decisions made in Step 2**

   The production capacity of the bottleneck resource should determine the production schedule for the organisation as a whole.

   Idle time is unavoidable and needs to be accepted if the theory of constraints is to be successfully applied.

4. **Elevate the system’s bottlenecks**

   This will normally require capital expenditure.

5. **If a new constraints is broken in Step 4, go back to Step 1**

   The likely constraint in the system is likely to be market demand.

The Throughput Accounting Ratio (TPAR)

Where there is a bottleneck resource (limiting factor), performance can be measured in terms of throughput for each unit of bottleneck resource consumed.

Three important ratios

- **Throughput (return) per factory hour**

  $$\frac{\text{Throughput per unit}}{\text{Product's time on the bottleneck resource}}$$

- **Cost per factory hour**

  Total Factory Cost
  ---
  Total time available on bottleneck resource

  The cost per factory hour is across the whole factory and therefore only needs to be calculated once (not for each product).

- **Throughput accounting Ratio**

  Return per factory hour
  ---------------------------
  Cost per factory hour

TPAR more than 1 would suggest that throughput exceeds operating costs so the product should make a profit.

Priority should be given to the products generating the best ratios.

TPAR less than 1 would suggest that throughput is insufficient to cover operating costs, resulting in a loss.

Criticisms of TPAR

1. It concentrates on the short-term
2. It is more difficult to apply throughput accounting concepts to the longer term when all costs are variable
3. In the long run, ABC might be more appropriate for measuring and controlling performance

Improving a TPAR

How a TPAR could be improved

Management should focus attention upon improving the throughput accounting ratio. If they can do this then higher levels of profit will be achieved.

Options to improve the TPAR include: -

1. increase the selling price – this will increase throughput per unit

2. reduce material costs per unit – this will also increase throughput per unit

3. reduce total operating expenses – this will reduce the total factory costs

4. improve the productivity of the assembly workforce. Therefore, the time required to make each unit will fall and throughput will increase.

Throughput Accounting in Multi-Product situations

Multi-product decision-making

Apply throughput accounting to a multi-product decision-making problem

1. calculate the throughput per unit for each product (selling price – material cost)
2. identify the bottleneck constraint
3. calculate the throughput return per hour of bottleneck resource
4. rank the products in order of the priority in which they should be produced starting with the product that generates the highest return per hour first
5. calculate the optimum production plan, allocating the bottleneck resource to each one in order, being sure not to exceed the maximum demand for any of the products.

Syllabus B5. Environmental Accounting

Management of Environmental Costs

What is environmental accounting?

It focuses on reports (including environment-related information both externally and internally) for shareholders and other stakeholders.

What is environmental management accounting?

Environmental management accounting is simply a specialised part of the management accounts that focuses on things such as the cost of energy and water and the disposal of waste and effluent.

It is a subset of environmental accounting.

It focuses on information required for decision making within the organisation (**internally focused**), although much of the information it generates could also be used for external reporting.

The focus of environmental management accounting is not all on purely financial costs.

It includes consideration of other non-financial matters such as the costs vs. benefits of buying from suppliers who are more environmentally aware, or the effect on the public image of the company from failure to comply with environmental regulations.

Defining environmental costs

Many organisations vary in their definition of environmental costs.

A useful cost categorisation is that provided by the US Environmental Protection Agency in 1998.
They stated that the definition of environmental costs depended on how an organisation intended on using the information.

They made a distinction between four types of costs:

1. **conventional costs**: raw material and energy costs having environmental relevance
2. **potentially hidden costs**: costs captured by accounting systems but then losing their identity in ‘general overheads’
3. **contingent costs**: costs to be incurred at a future date, e.g. clean up costs
4. **image and relationship costs**: costs that, by their nature, are intangible, for example, the costs of producing environmental reports.

The UNDSD, on the other hand, described environmental costs as comprising of:

1. **costs incurred to protect the environment**, e.g. measures taken to prevent pollution; and
2. **costs of wasted material, capital and labour**, i.e. inefficiencies in the production process.

Neither of these definitions contradict each other; they just look at the costs from slightly different angles.

Managing environmental costs – its importance

Environmental risks cannot be ignored, they are now as much a part of running a successful business as product design, marketing, and sound financial management.

There are three main reasons why the management of environmental costs is becoming increasingly important in organisations.

- society as a whole has become more environmentally aware, with people becoming increasingly aware about the ‘carbon footprint’ and recycling taking place now in many countries.

  Companies are finding that they can increase their appeal to customers by portraying themselves as environmentally responsible.

- environmental costs are becoming huge for some companies, particularly those operating in highly industrialised sectors such as oil production.

  In some cases, these costs can amount to more than 20% of operating costs. Such significant costs need to be managed.

- regulation is increasing worldwide at a rapid pace, with penalties for non-compliance also increasing accordingly.

  Penalties include fines, increased liability to environmental taxes, loss in value of land, destruction of brand values, loss of sales, consumer boycotts, inability to secure finance, loss of insurance cover, contingent liabilities, law suits and damage to corporate image.

In the largest ever seizure related to an environmental conviction in the UK, a plant hire firm, John Craxford Plant Hire Ltd, had to not only pay £85,000 in costs and fines but also got £1.2m of its assets seized.

This was because it had illegally buried waste and also breached its waste and pollution permits.

And it's not just the companies that need to worry.

Officers of the company and even junior employees could find themselves facing criminal prosecution for knowingly breaching environmental regulations.

In 2010, the failure of a 40-ft-tall blowout preventer has severely damaged BP's image and wiped out more than $20 billion of the company's stock market value.

BP claimed it was spending $6 million a day on the salvage effort.

The spill cost BP more than $4.6 billion in containment and clean-up expenses.

The oil spill also affected the Louisiana fishing industr and the tourism business along the Florida coast.

By failing to incorporate environmental concerns, organisations are unaware of the impact on the income statement and statement of financial position of environment-related activities.

Moreover, they miss out on identifying cost reduction and other improvement opportunities, employ incorrect product/service pricing, mix and development decisions.

This leads to a failure to enhance customer value, while increasing the risk profile of investments and other decisions with long-term consequences.

Accounting for Environmental Costs

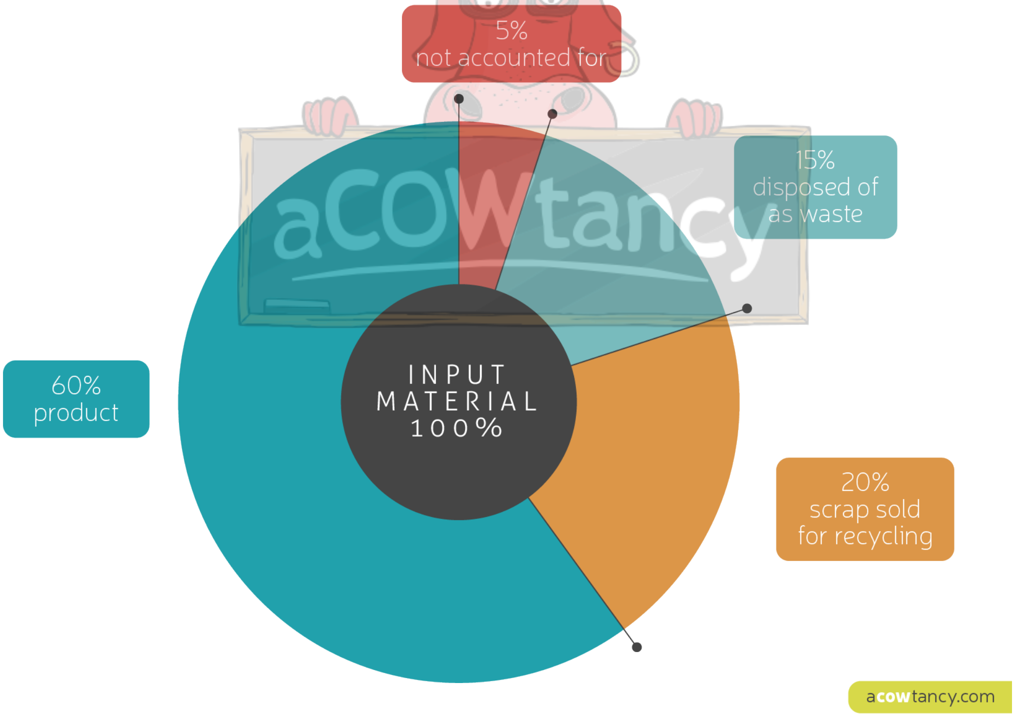
Environmental management accounting

Environmental management accounting uses some standard accountancy techniques to identify, analyse, manage and hopefully reduce environmental costs in a way that provides mutual benefit to the company and the environment, although sometimes it is only possible to provide benefit to one of these parties.

In 2003, the UNDSD identified four management accounting techniques for the identification and allocation of environmental costs: input/ outflow analysis, flow cost accounting, activity based costing and lifecycle costing.

1. Input/outflow analysis

This technique records material inflows and balances this with outflows on the basis that, what comes in, must go out.



Input/output analysis according to Envirowise

The purchased input is regarded as 100% and balanced against the outputs – which are produced, sold and stored goods and the residual (regarded as waste).

Materials are measured in physical unit and include energy and water.

For example, if 100kg of materials have been bought and only 80kg of materials have been produced, then the 20kg difference must be accounted for in some way.

It may be that 10% of it has been sold as scrap and 90% of it is waste.

By accounting for outputs in this way, both in terms of physical quantities and, at the end of the process, in monetary terms too, businesses are forced to focus on environmental costs.

2. Flow cost accounting

This technique uses not only material flows but also the organisational structure.

It makes material flows transparent by looking at the physical quantities involved, their costs and their value.

It divides the material flows into three categories: **material, system,** and **delivery and disposal**.

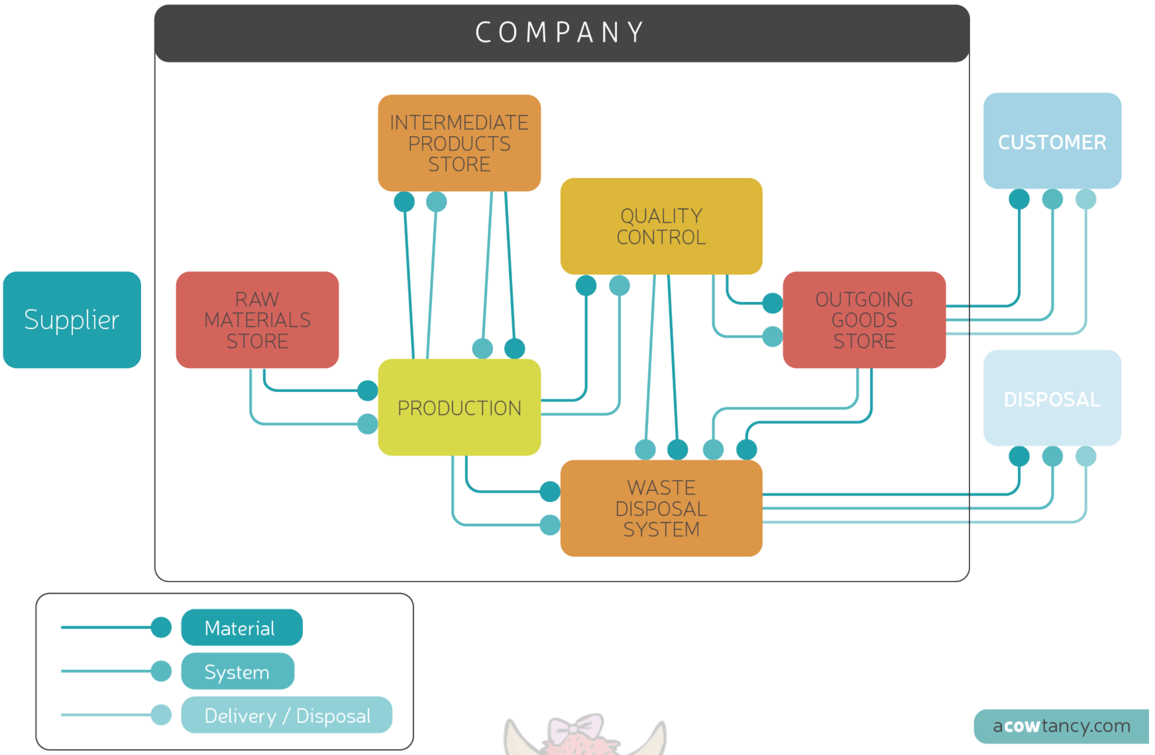
i. The **material** values and costs apply to the materials which are involved in the various processes.

ii. The **system** values and costs are the in-house handling costs which are incurred to maintain and support material throughput e.g. personnel costs and depreciation.

iii. The **delivery and disposal** values and costs refer to the costs of flows leaving the company, e.g. transport costs or costs of disposing waste.

The values and costs of each of these three flows are then calculated.

The aim of flow cost accounting is to reduce the quantity of materials which, as well as having a positive effect on the environment, should have a positive effect on a business' total costs in the long run.



3. Activity-based costing (ABC)

ABC allocates internal costs to cost centres and cost drivers on the basis of the activities that give rise to the costs.

In an environmental accounting context, it distinguishes between environment-related costs, which can be attributed to joint cost centres (e.g. incinerators and sewage plants), and environment-driven costs, which tend to be hidden on general overheads, e.g. increased depreciation or higher cost of staff.

For example, activity-based costing may be used to ascertain more accurately the costs of washing towels at a gym.

The energy used to power the washing machine is an environmental cost; the cost driver is ‘washing’.

Once the costs have been identified and information accumulated on how many customers are using the gym, it may actually be established that some customers are using more than one towel on a single visit to the gym.

The gym could drive forward change by informing customers that they need to pay for a second towel if they need one. Given that this approach will be seen as ‘environmentally-friendly’, most customers would not argue with its introduction.

Nor would most of them want to pay for the cost of a second towel. The costs to be saved by the company from this new policy would include both the energy savings from

having to run fewer washing machines all the time and the staff costs of those people collecting the towels and operating the machines.
Presumably, since the towels are being washed less frequently, they will need to be replaced by new ones less often as well.

In addition to these savings to the company, however, are the all-important savings to the environment since less power and cotton (or whatever materials the towels are made from) is now being used, and the scarce resources of our planet are therefore being conserved.

Lastly, the gym is also seen as an environmentally friendly organisation and this, in turn, may attract more customers and increase revenues.

4. Lifecycle costing

Within the context of environmental accounting, lifecycle costing (full costing) is a technique which requires the full environmental consequences, and, therefore, costs, arising from production of a product to be taken account across its whole lifecycle, literally ‘from cradle to grave’.

One example of the potential gains from using lifecycle costing can be seen in the case of Xerox Limited.

Xerox Limited, a subsidiary of Xerox Corporation, introduced the concept of lifecycle costing for its logistic chain. The core business of Xerox Limited is manufacturing photocopiers, which are leased rather than sold.

This means the machines are returned to Xerox Limited at the end of their lease. Previously, machines were shipped in a range of different types of packaging, which could rarely be re-used by customers to return the old copiers.

The customer had to dispose of the original packaging and to provide new packaging to return the machine at the end of its lease, which in turn could not be used to re-ship other machines.

This meant Xerox lost the original costs and had to bear the costs of disposal of the packaging.

A new system was invented which used a standard pack (tote).

Two types of totes were introduced to suit the entire range of products sold by Xerox. Totes can be used for both new machines delivery and return carcasses.

The whole-chain cost analysis showed the considerably lower cost of the tote system, compared to the previously existing system and the supply chain became more visible.

The tote system resulted not only in cost savings but also in reduced ‘de-pack’ times and improved customer relations (Bennett and James, 1998b).

The above–mentioned accounting techniques are useful for environmental management accounting to identify and allocate environmental costs.
In addition, there are alternative techniques to estimate environmental costs such as the ‘environmental cost decision tree’.

Also, the undertaking of environmental audits on a regular basis provides the platform for a successful programme of **total quality management (TQM)**.

How do organisations control environmental costs?

How do organisations control these environmental costs?

It is only after environmental costs have been defined, identified and allocated that a business can begin the task of trying to control them.

Let us consider an organisation whose main environmental costs are as follows:

1. waste and effluent disposal
2. water consumption
3. energy
4. transport and travel
5. consumables and raw materials

Environmental costs

1. Waste and effluent disposal

There are lots of environmental costs associated with waste.

For example, the costs of unused raw materials and disposal; taxes for landfill; fines for compliance failures such as pollution.

It is possible to identify how much material is wasted in production by using the 'mass balance' approach, whereby the weight of materials bought is compared to the product yield. From this process, potential cost savings may be identified.

In addition to these monetary costs to the organisation, waste has environmental costs in terms of lost land resources (because waste has been buried) and the generation of greenhouse gases in the form of methane.

2. Water

Businesses actually pay for water twice – first, to buy it and second, to dispose of it.

If savings are to be made in terms of reduced water bills, it is important for organisations to identify where water is used and how consumption can be decreased.

3. Energy

A recent UK government publicity campaign reports that companies are spending, on average, an extra 30% on energy through inefficient practices.

With good energy management, we could reduce the environmental impact of energy production by 30% and slash 30% of the organisations' energy expenditure.

For example, environmental management accounts may help to identify inefficiencies and wasteful practices and, therefore, opportunities for cost savings.

4. Transport and travel

Again, environmental management accounting can often help to identify savings in terms of business travel and transport of goods and materials.

At a simple level, a business can invest in more fuel-efficient vehicles.

5. Consumables and raw materials

These costs are usually easy to identify and discussions with senior managers may help to identify where savings can be made.

For example, toner cartridges for printers could be refilled rather than replaced. This should produce a saving both in terms of the financial cost for the organisation and a waste saving for the environment (toner cartridges are difficult to dispose of and less waste is created this way).

It is equally important to allocate environmental costs to the processes or products which give rise to them. Only by doing this can an organisation make well-informed business decisions.

For example, a pharmaceutical company may be deciding whether to continue with the production of one of its drugs.

In order to incorporate environmental aspects into its decision, it needs to know exactly how many products are input into the process compared to its outputs; how much waste is created during the process; how much labour and fuel is used in making the drug; how much packaging the drug uses and what percentage of that is recyclable etc.

Only by identifying these costs and allocating them to the product can an informed decision be made about the environmental effects of continued production.

How should environmental information be reported?

Hansen and Mendoza (1999) stated that environmental costs are incurred because of poor quality controls.

Therefore, they advocate the use of a periodical environmental cost report that is produced in the format of a cost of quality report, with each category of cost being expressed as a percentage of sales revenues or operating costs so that comparisons can be made between different periods and/or organisations.

The categories of costs would be as follows:

1. Environmental prevention costs: the costs of activities undertaken to prevent the production of waste.
2. Environmental detection costs: costs incurred to ensure that the organisation complies with regulations and voluntary standards.
3. Environmental internal failure costs: costs incurred from performing activities that have produced contaminants and waste that have not been discharged into the environment.
4. Environmental external failure costs: costs incurred on activities performed after discharging waste into the environment.

Identifying environmental costs

Much of the information that is needed to prepare environmental management accounts could actually be found in a business' general ledger.

A close review of it should reveal the costs of materials, utilities and waste disposal, at the least. The main problem is, however, that most of the costs will have to be found within the category of 'general overheads' if they are to be accurately identified.

Identifying them could be a lengthy process, particularly in a large organisation.
The management of environmental costs can be a difficult process.

This is because:

1. just as EMA is difficult to define, so too are the actual costs involved.
2. having defined them, some of the costs are difficult to separate out and identify.
3. the costs can need to be controlled but this can only be done if they have been correctly identified in the first place.

Environmental costs can be:

1. ***External costs***

   Are costs that have an effect on society.

   For example:

   Carbon emissions
   Pollution
   Energy usage
   Use and waste of natural resources

2. ***Internal costs***

   Are costs that influence only company itself.
   They have no impact on society.

   For example:

   Inspection of products to ensure regulatory compliance
   Emission permits
   Environmental fines and taxes
   Training of employees
   Decontamination and cleaning

Syllabus C: Decision-making Techniques

Syllabus C1. Relevant Cost Analysis

Concept of Relevant Costing

Any short term decisions should be approached using relevant costing principles

Companies and government bodies have increasingly tended to concentrate on their core competences – what they are really good at – and turn other functions over to specialist contractors.

This is known as **outsourcing** or **sub-contracting**.

Relevant costs and revenues are:

- In the FUTURE
- CASH only
- INCREMENTAL only

Decision making should be based on relevant costs and revenues.

1. Relevant costs are **FUTURE costs**.

   A decision is about the future and it cannot alter what has been done already. Costs that have been incurred in the past are totally irrelevant to any decision that is being made 'now'.

   Such costs are called past costs or sunk costs and are irrelevant.

2. Relevant costs are **CASHFLOWS**.

   Only cash flow information is required.

This means that costs or charges which do not reflect additional cash spending (such as depreciation and notional costs) should be ignored for the purpose of decision making.

3. Relevant costs are **INCREMENTAL costs** and it is the increase in costs and revenues that occurs as a direct result of a decision taken that is relevant.

   Common costs can be ignored for the purpose of decision making.

4. Relevant costs are **AVOIDABLE costs**

   These are costs which would not be incurred if the activity to which they relate did not exist.

   Therefore, they are relevant to a decision.

Committed costs are future costs that cannot be avoided because of decisions that have already been made.

These are non-relevant costs

Opportunity Costs

Opportunity costs only arise when resources are scarce and have alternative uses.

When an alternative course of action is given up, the financial benefits lost are known as opportunity costs.

So they are the lost contribution from the best use of the alternative forgone.

Relevant cost of Materials

If used & replaced regularly this is their current replacement cost

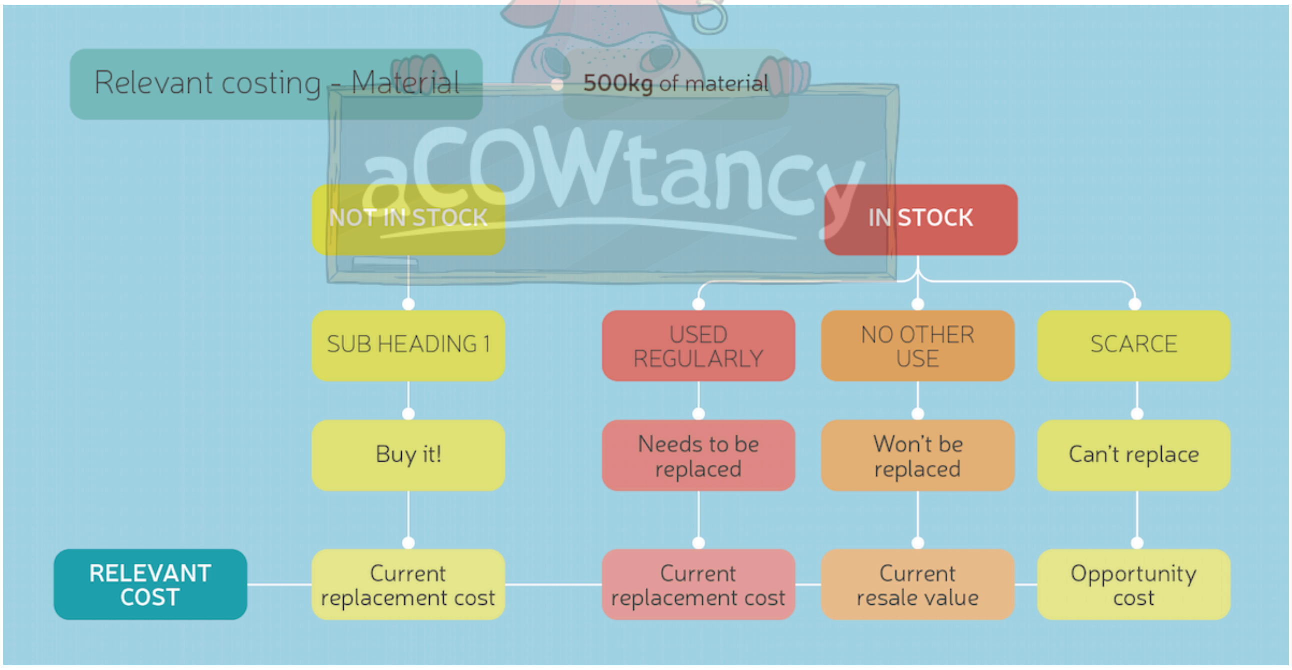
But what if we have already have them in stock and won't use them regularly?

Well then we can either **sell** them or **use** them on another project

So, here the relevant cost of using them is the higher of:

- Their current resale value
- Their alternative use value

So also if the materials have no resale value and no other possible use, then the relevant cost is nil



Material	Qty needed for contract	Qty currently in inventory	Original cost of qty in inv	Current purchase price	Current resale price

A	400 kg	200 kg	$10/kg	$15/kg	$12/kg
B	200 kg	100 kg	$20/kg	$22/kg	$15/kg

Material A is used regularly in the business.

Material B is no longer used and has no alternative use in the business.

The relevant cost of material is:

Material A – regularly used – replace
400 kg x $15 = $6000

Material B – 100 kgs in stock could have been sold if not used in the contract
opportunity cost = 100 kg x $15 = $1500

The other 10 0kg have to be purchased at $22
100 kg x $22 = $2200

Therefore $1500+$2200 = $3700

Please note that the original cost is a sunk cost, therefore irrelevant.

Relevant cost of Labour

The key question here is: Is there spare capacity?

Different Scenarios…

- **Spare capacity**

  So, additional work can be undertaken at no extra cost :)

  - Relevant cost of labour is a big, fat **0**

- **Full capacity - so hire more workers**

  - Relevant cost is **current pay rates**

- **Full capacity - takes workers from another project**

  So this project can't be finished :(- so we lose its contribution but we still have to pay the workers on our project

  - Relevant cost is **Lost contribution + labour cost**

Syllabus C2. Cost Volume Profit Analysis

CVP Analysis

Break even?

One of the most important decisions that needs to be made before any business even starts is *‘how much do we need to sell in order to break-even?’*

By **‘break-even’** we mean simply covering all our costs without making a profit.

This type of analysis is known as **‘cost-volume-profit analysis’ (CVP analysis).**

CVP analysis looks primarily at the effects of differing levels of activity on the financial results of a business.

The reason for the particular focus on sales volume is because, in the short-run, sales price, and the cost of materials and labour, are usually known with a degree of accuracy.

Sales volume, however, is not usually so predictable and therefore, in the short-run, profitability often hinges upon it.

Break-Even Point and Margin of Safety

Break-even point

The break-even point is when total revenues and total costs are equal
i.e. there is no profit but also no loss made.

There are three methods for ascertaining this BEP:

1. ***The equation method***

   Total revenue – total variable costs – total fixed costs = Profit

   Note: total fixed costs are used rather than unit fixed costs since unit fixed costs will vary depending on the level of output.

   Also, selling price and costs are assumed to remain constant per unit of output.

2. ***The contribution margin method***

   The contribution margin (contribution per unit) = selling price per unit less the variable costs per unit.

   BEP in units = Fixed Costs / Contribution per unit

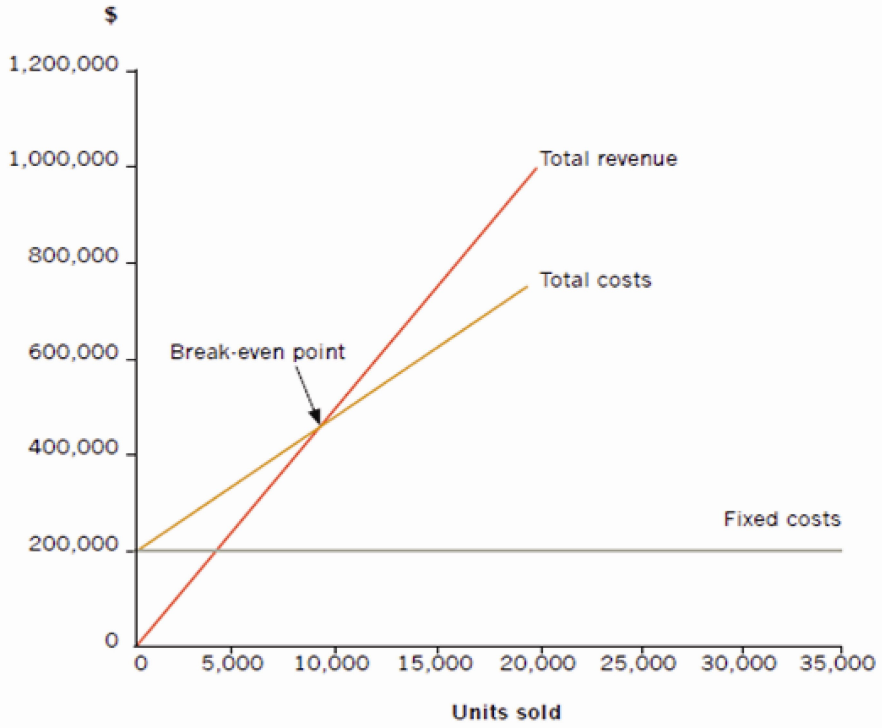
3. ***The graphical method***

   With the graphical method, the total costs and total revenue lines are plotted on a graph; $ is shown on the y axis and units are shown on the x axis.

   The point where the total cost and revenue lines intersect is the **break-even point**. The amount of profit or loss at different output levels is represented by the distance between the total cost and total revenue lines.

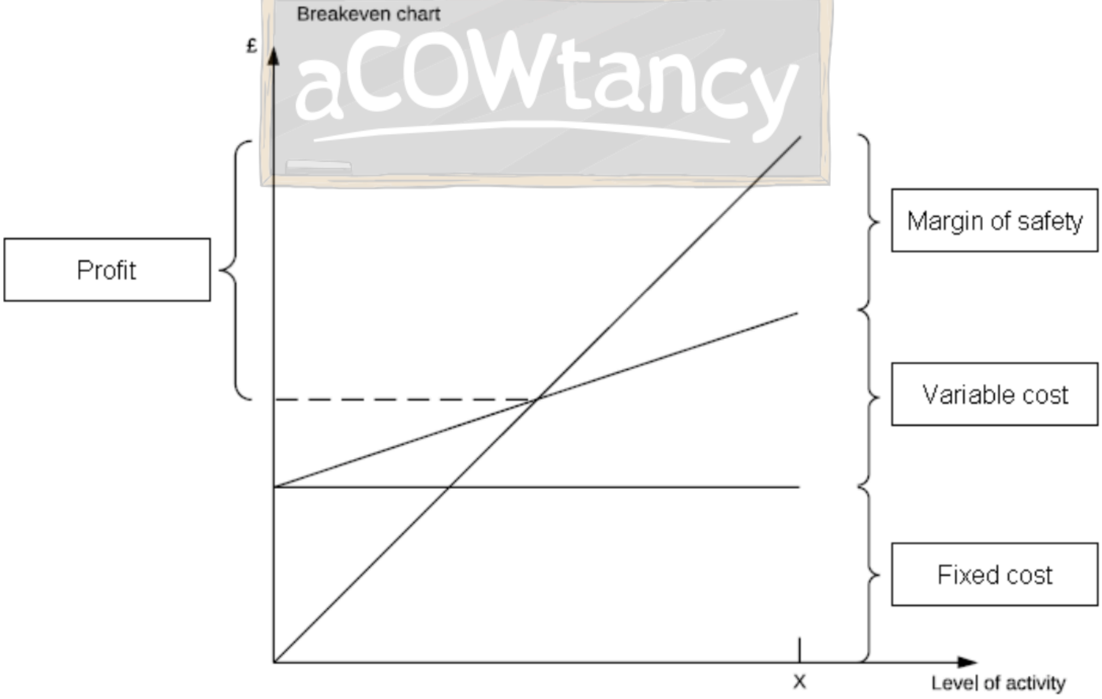
   The graph below shows a typical break-even chart.

   The gap between the fixed costs and the total costs line represents variable costs.



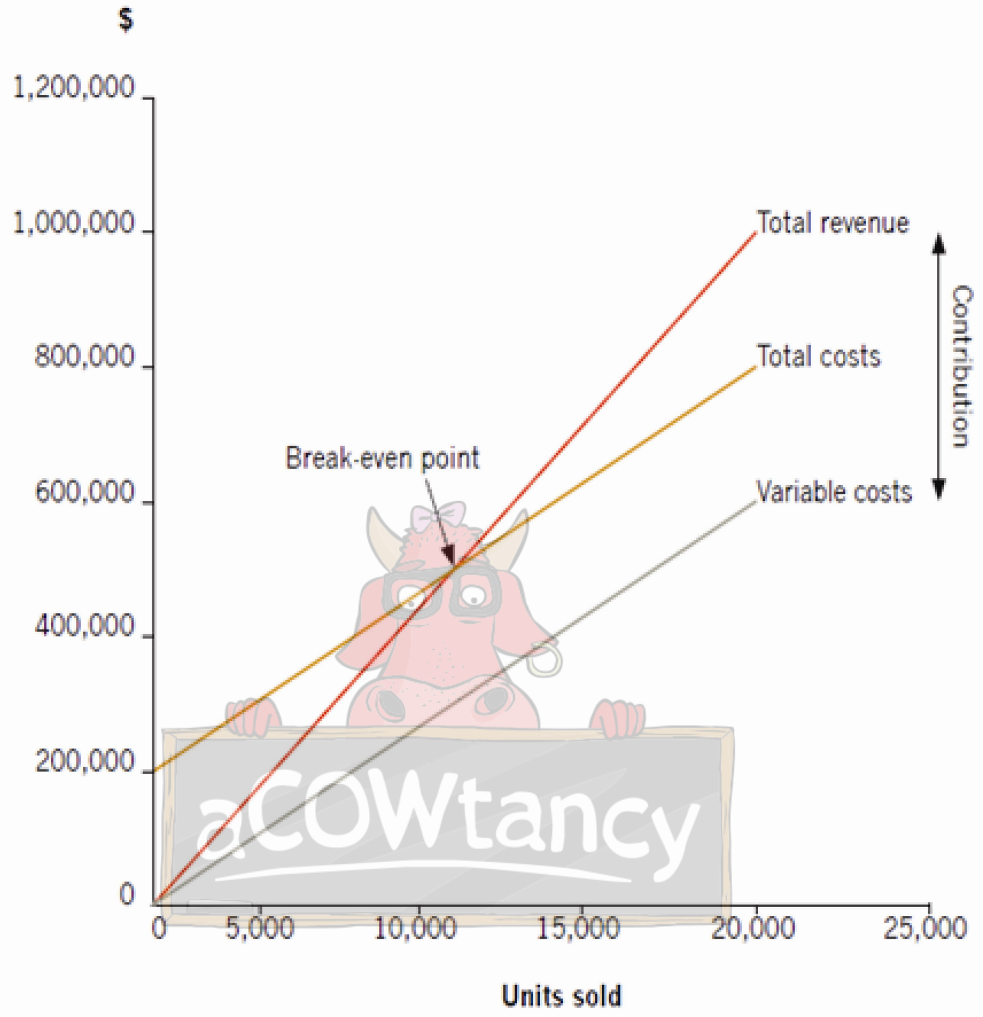
(Extract from 'Cost-Volume-Profit Analysis' by A. Iron, Student Accountant, 14/2010)
www.accaglobal.com/content/dam/acca/global/PDF-students/2012s/sa_jul10_F5_t_cvp.pdf

The Breakeven chart can be read as:



Alternatively, a **contribution graph** could be drawn.

This is very similar to a break-even chart; the only difference being that instead of showing a fixed cost line, a variable cost line is shown instead.
Hence, it is the difference between the variable cost line and the total cost line that represents fixed costs. The advantage of this is that it emphasises contribution as it is represented by the gap between the total revenue and the variable cost lines.



(Extract from 'Cost-Volume-Profit Analysis' by A. Iron, Student Accountant, 14/2010)
www.accaglobal.com/content/dam/acca/global/PDF-students/2012s/sa_jul10_F5_t_cvp.pdf

Margin of safety

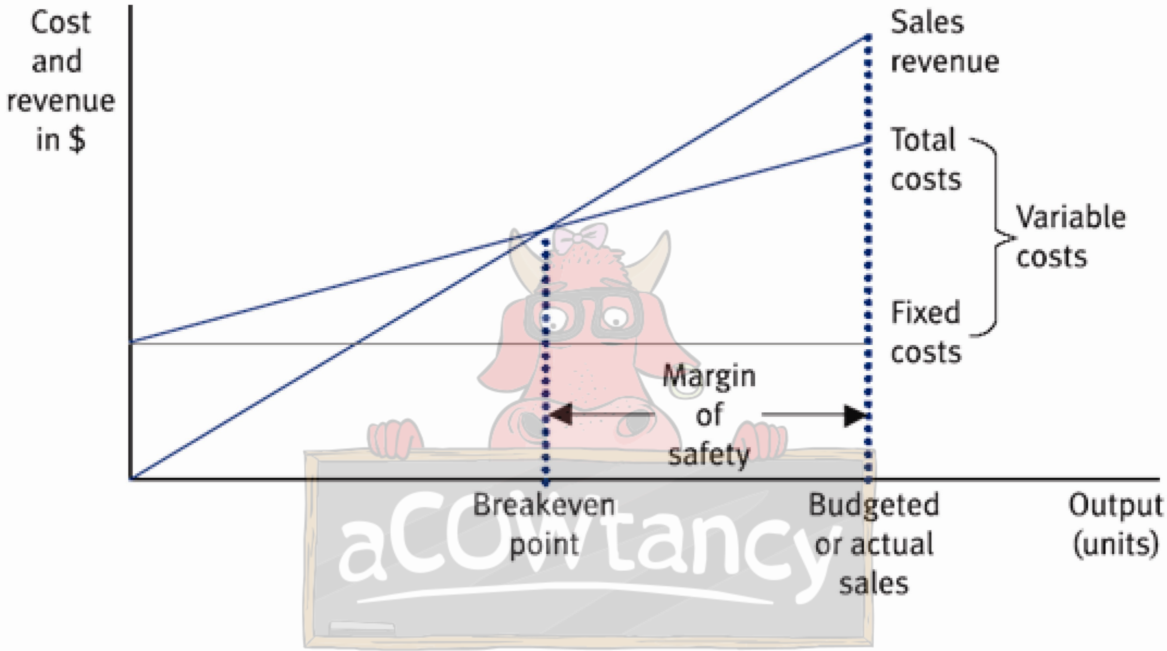
The margin of safety indicates by how much sales can decrease before a loss occurs, i.e. it is the excess of budgeted revenues over break-even revenues.

Alternatively, it may be calculated as a percentage:

$$\frac{\textbf{Budgeted sales (units) – break-even sales (units)}}{\textbf{Budgeted sales (units)}} \times 100$$

It could be calculated in terms of $ sales revenue as follows:

[Budgeted sales (units) – break-even sales (units)] x selling price



Single and Multi-Product Situations: Contribution to Sales Ratio

Single product situations

It is often useful in single product situations, and essential in multi-product situations, to ascertain how much each $ sold actually contributes towards the fixed costs.

This calculation is known as the contribution to sales or C/S ratio.

The C/S ratio is invaluable in helping us to quickly calculate the break-even point in $ sales revenue: -

BEP (sales revenue)

$$\frac{\text{Fixed Costs}}{\text{C/S ratio}}$$

In single product situations, C/S ratio is calculated as follows: -

$$\frac{\textbf{Total contribution}}{\textbf{Total sales revenue}}$$

or

$$\frac{\textbf{Contribution per unit}}{\textbf{Selling price}}$$

In multi-product situations, a weighted average C/S ratio is calculated by using the formula:

$$\frac{\text{Total contribution}}{\text{Total sales revenue}}$$

This weighted average C/S ratio can then be used to find CVP information such as break-even point, margin of safety, required profit (section 9.4 below) etc.

Breakeven Point (BEP) =

$$\frac{\text{Fixed Costs}}{\text{Average C/S Ratio}}$$

Single and Multi-Product Situations: Target Profit or Revenue

Target Profit or Revenue

How many units must be sold to earn a target profit or revenue of an $x amount? The sales volume necessary in order to achieve this profit can be ascertained using any of the three methods outlined above

- The equation method

  Total revenue – total variable costs – total fixed costs = Target Profit/Revenue

- The contribution margin method

  The contribution margin (contribution per unit) =

  BEP in units =

  $$\frac{\textbf{Fixed Costs + Target Profit / Revenue}}{\textbf{Contribution per unit}}$$

  In a multi-product situation,

  Required Revenue =

  $$\frac{\textbf{Fixed Costs + Target Profit / Revenue}}{\textbf{Average C/S Ratio}}$$

- The graphical method

  The answer can also be read from the graph. The gap between the total revenue and total cost line represents profit (after the break even point) or loss (before the break even point).

Illustration 2

ABC Ltd has provided us with the following information: -

Selling price per unit $100
Variable costs per unit $60
Fixed Costs $250,000 per annum

ABC Ltd. wants to achieve a target profit of $400,000.

Calculate the number of units which the company should produce and sell next year in order to achieve the target level of profit.

Equation Method

tr - tvc - tfc	profit
100q - 60q - 250000	400000
40q	650000
q	**16250 units**

OR

Contribution Margin Method

bep (units)	fc + tp ------- cont/unit
	250000 + 40000 ------------------ 40
	16250 units

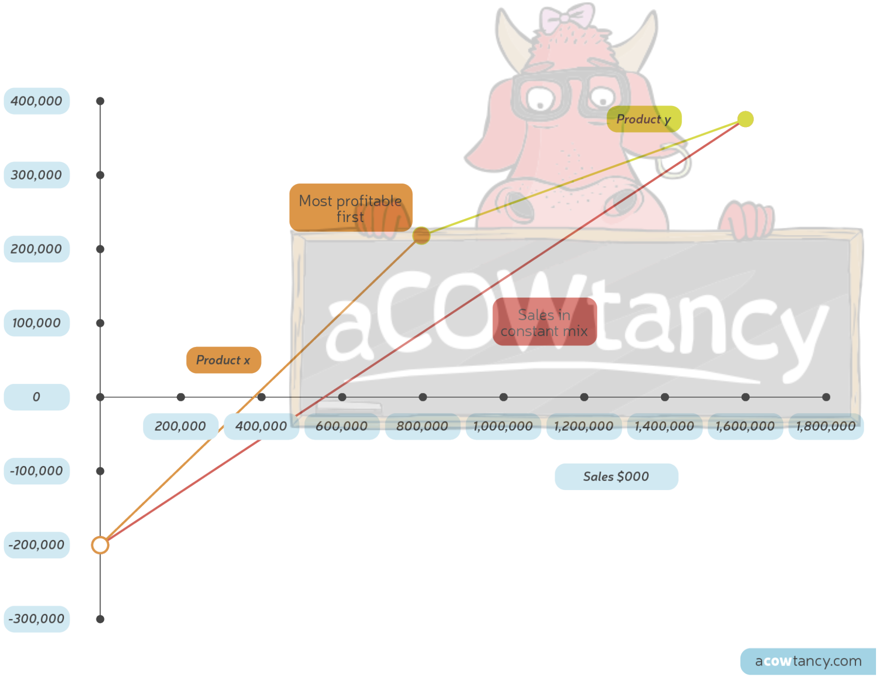
Break-Even Charts and Profit Volume

Break-Even Charts

The breakeven point is where the total revenues line and the total costs line intersect. The profit-volume graph focuses purely on showing a profit/ loss line and doesn't separately show the cost and revenue lines.

In a multi-product environment, it is common to actually show two lines on the graph: one straight line, where a constant mix between the products is assumed; and one bow-shaped line, where it is assumed that the company sells its most profitable product first and then its next most profitable product, and so on.

In order to draw the graph, it is therefore necessary to work out the C/S ratio of each product being sold before ranking the products in order of profitability.



It can be observed from the graph that, when the company sells its most profitable product first (x) it breaks even earlier than when it sells products in a constant mix.

The break-even point is the point where each line cuts the x axis.

Limitations of CVP Analysis for Planning and Decision Making

Limitations of CVP Analysis for Planning and Decision Making

These are:

1. Cost-volume-profit analysis is invaluable in demonstrating the effect on an organisation that changes in volume (in particular), costs and selling prices, have on profit.

   However, its use is limited because it is based on the following assumptions: either a single product is being sold or, if there are multiple products, these are sold in a constant mix.

   We have considered this above and seen that if the constant mix assumption changes, so does the break-even point.

2. All other variables, apart from volume, remain constant, i.e. volume is the only factor that causes revenues and costs to change.

   In reality, this assumption may not hold true as, for example, economies of scale may be achieved as volumes increase.

   Similarly, if there is a change in sales mix, revenues will change. Furthermore, it is often found that if sales volumes are to increase, sales price must fall.

3. The total cost and total revenue functions are linear. This is only likely to hold true within a short-run, restricted level of activity.

4. Costs can be divided into a component that is fixed and a component that is variable.

   In reality, some costs may be semi-fixed, such as telephone charges, whereby there may be a fixed monthly rental charge and a variable charge for calls made.

5. Fixed costs remain constant over the 'relevant range' – levels of activity in which the business has experience and can therefore perform a degree of accurate analysis.

   It will either have operated at those activity levels before or studied them carefully so that it can, for example, make accurate predictions of fixed costs in that range.

6. Profits are calculated on a variable cost basis or, if absorption costing is used, it is assumed that production volumes are equal to sales volumes.

Illustration

Hughes plc has recently developed a personal music player and is now considering what price to charge for the new product.

A market research company has produced the following forecasts of demand at three potential selling prices:

selling price	US$250	US$350	US$450
sales units per annum	10000	8000	6000
fixed costs per annum	US$800000	US$500000	$200000

Variable costs are forecast at $220 per unit at any activity level.

Required:

a) Calculate, for each potential selling price, the budgeted profit, the break-even point in units and the margin of safety ratio (i.e. the margin of safety expressed as a percentage).

b) Using the graph paper provided, draw and label a break-even chart for a selling price of $350 for activity levels between 0 and 8,000 units.

(CAT Paper T7 June 2005 Qs 2 amended)

(a)

	$	$	$
selling price	250	350	450
variable cost	220	220	220
	-----	-----	-----
contribution per unit	30	130	230
total units	1000	8000	6000
total contribution	300000	1040000	1380000
fixed cost	800000	500000	200000
	-----	-----	-----
profit	(50000)	540000	1180000

Breakeven point in units = Fixed costs/contribution per unit

selling price ($)	250	350	450
contribution per unit (1)	30	130	230
fixed cost ($)(2)	800000	500000	200000
breakeven point (units) (2 / 1)	26667	3846	870
budgeted units	10000	8000	6000
total units	1000	8000	6000
margin of safety	nil	4154	5130
margin of safety ratio	nil	52%	86%

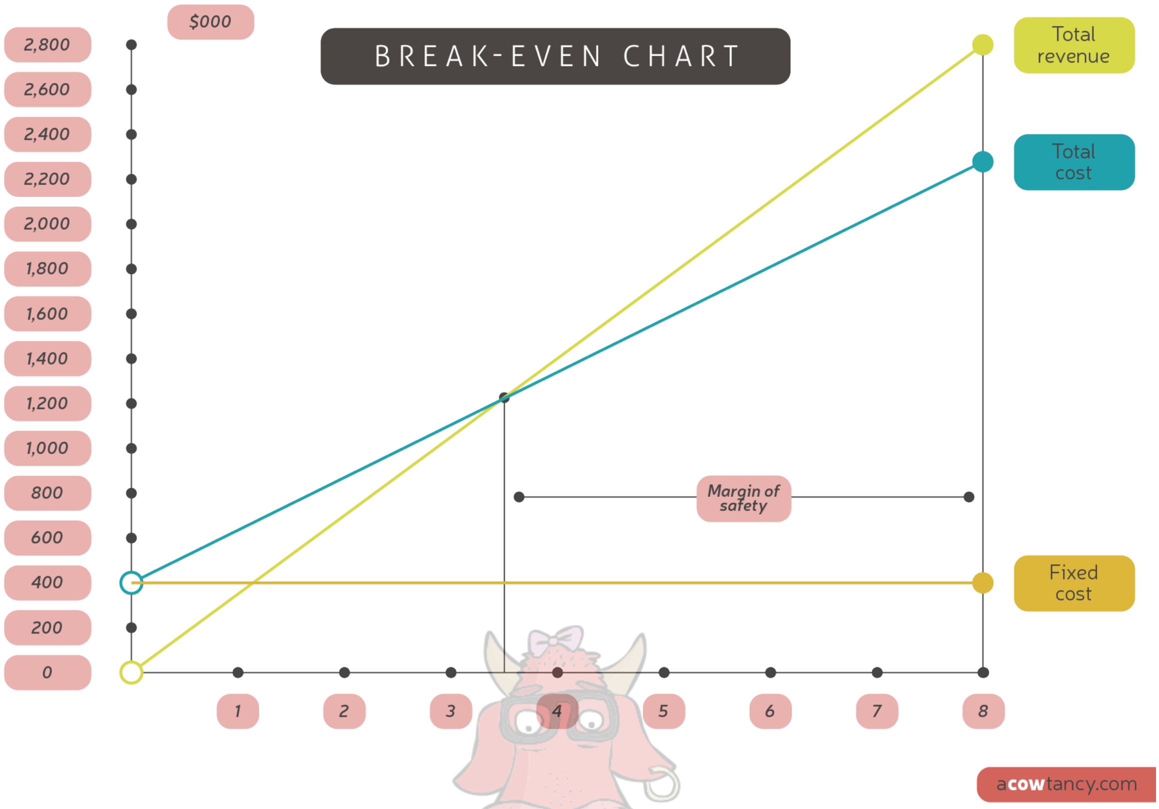
MOS = Budgeted Sales – Break-Even Sales

Or

Budgeted Sales – Break-Even Sales

Budgeted Sales

b) Breakeven Chart



Syllabus C3. Limiting Factors

Identifying Limiting Factors in a Scarce Resource Situation

Limiting Factor

A **limiting factor** is the factor (aspect of business/resource) that limits an organisation's activities.

For many businesses, this may frequently be the level of sales that can be achieved but at other times a business may be limited by a shortage of a resource which prevents the business from achieving its sales potential.

Other examples of limiting factors would include:

1. supply of skilled labour;
2. supply of materials;
3. factory space;
4. finance;
5. plant capacity; and
6. market demand.

A business may face **a single constraint situation** however, others may face **a multi constraint scenario.**

Determining the Optimal Production Plan re a single limiting factor

Planning with one limiting factor

When there is only one scarce resource, key factor analysis can be used to solve the problem.

Options must be ranked using contribution earned per unit of the scarce resource.

Three steps in key factor analysis

1. Step 1: - First determine the limiting factor (bottleneck resource)
2. Step 2: - Rank the options using the contribution earned per unit of the scarce resource
3. Step 3: - Allocate resources

	Product A	**Product B**
SP / Unit	100	120
VC / Unit	80	75
FC / Unit	10	12
Skilled Labour / Unit	0.5 hr	0.75 hr
Demand (units)	5,000	4,000

How many labour hours are required?	
Required: Product A (0.5 x 5000)	2,500
Required Product B (0.75 x 4000)	3,000
	5,500
Available	4,000
Shortfall	**1,500**
\ **Labour hours are a limiting factor**	

	Product A	**Product B**
SP / Unit	100	120
VC / Unit	80	75
Cont / Unit	20	45
Lab hrs / Unit	0.5	0.75
Cont / Lab hr	40	60
Ranking	2	1

Prod Plan

Product	**Units**	**Lab Hrs / Unit**	**Total Lab Hrs**
			Available = 4,000
Product B	4,000	0.75	(3,000)
			Available 1,000
Product A	1,000/0.5 = 2,000	0.5	(1,000)
			Available 0

Therefore, produce 2000 units of Product A
and 4000 units of Product B

Assumptions

1. A single quantifiable objective. In reality, there may be multiple objectives.
2. Each product always uses the same quantity of the scarce resource per unit.
3. The contribution per unit is constant. However, the selling price may have to be lowered to sell more; discounts may be available as the quantity of materials needed increases.
4. Products are independent. It may not be possible to prioritise product A at the expense of product B.
5. We focus on the short term, therefore ignoring fixed costs.

Formulating and Solving Multiple Scarce Resource Problems

Linear programming

When there are two or more resources in short supply, linear programming is required to find the solution.

Linear programming is used to:

1. maximise contribution and/or

2. minimise costs

Steps involved in linear programming

1. Define the variables
2. Define and formulate the objective
3. Formulate the constraints
4. Draw a graph identifying the feasible region. The constraints are represented as straight lines on the graph.

   The feasible region shows those combinations of variables which are possible given the resource constraints.

5. Solve for the optimal production plan. An iso-contribution line (an objective function for a particular value) must be drawn. All points on this line represent an equal contribution.

   This line must move to and from the origin in parallel. The objective is to get the highest contribution or the minimum cost within the binding constraints.

A linear programming situation can be solved using simultaneous equations. However, this technique should be used after one has determined graphically the constraints and the feasible region.

Linear programming assumptions

1. a single quantifiable objective

2. each product always uses the same quantity of the scarce resource per unit.
3. the contribution (or cost) per unit is constant for each product, regardless of the level of activity. Therefore, the objective function is a straight line.
4. products are independent
5. the focus is short-term
6. all costs either vary with a single volume-related cost driver or they are fixed for the period under consideration.

Illustration

A company manufactures two types of boxes, Box A and Box B.

Contribution / box A = \$20 Contribution / box B = \$45

Two materials, X and Y are used in the manufacturing of each box.
Each material is in short supply.

Material X = 3,000 kg available Material Y = 2,700 kg available

Each box A uses 20 kg of Material X and 15 kg of Material Y
Each box B uses 30 kg of Material X and 50 kg of Material Y

The objective of this company is to maximise profits.

Variables

Let A be the number of boxes of A produced and sold
Let B be the number of boxes of B produced and sold

Objective function

Max C = 20A + 45B

Constraints

Mat X = 20A + 30B ≤ 3,000
Mat Y = 15A + 50B ≤ 2,700

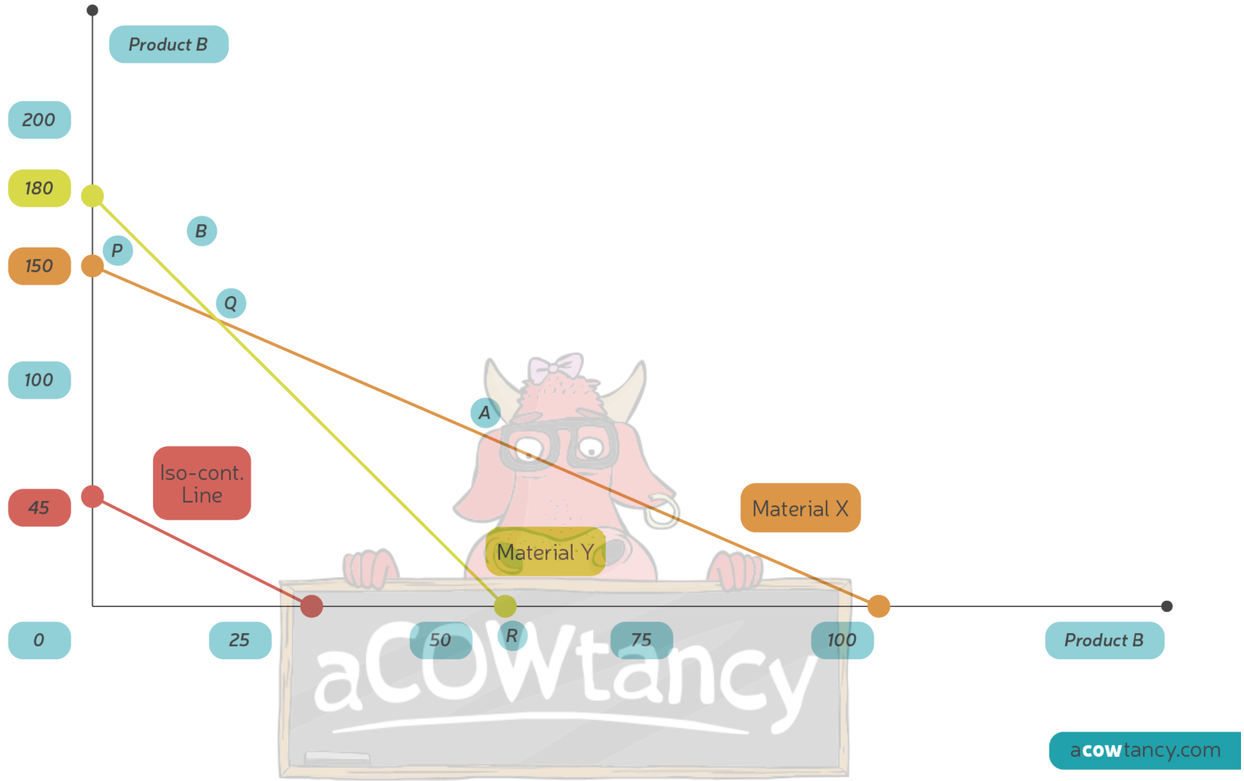
Non-negativity = A,B ≥ 0

Material X

20A + 30B = 3,000
When A is 0, B = 100

When B is 0, A = 150

Material Y
15A + 50B = 2700
When A = 0, B = 54
When B = 0, A = 180



How can we draw the iso-contribution line?

20A + 45B = 900 --- take a number which is a multiple of both the 20 and the 45

when A is 0, B = 20
when B is 0, A = 45

Which is the optimal point?

1. Shift out the objective function.

2. We need to maximise profits. Hence the optimal point is the last point to reach in the feasible region, OPQR

Therefore the optimal point in the above example is B.

How can I find the optimal point using simultaneous equations?

1. Find the contribution at each point on the feasible region.

At point O, contribution is 0

At point P, contribution is 20A + 45B
20(150) + 45(0) = 3,000

At point R, contribution is 20A + 45B
20(0) + 45(54) = 2430

At point Q – point of intersection of material X, material Y.

Material X = 20A + 30B = 3,000 ………… x5
Material Y = 15A + 50B = 2,700 ………… x3

100A + 150B = 15,000
45A + 150B = 8,100
55A = 6,900
A = 125.45

100(125.45) + 150B = 15,000
B = 16.36

Contribution = 20A + 45B
= 20(125.45) + 45(16.36)
= 2509 + 736.2
= 3245.2

Therefore point Q is the optimal point where contribution is $3245.20

Shadow Prices (Dual Prices)

Shadow price

Any scarce resource that is fully utilised in the optimal solution will have a **shadow price.**

It would be worth paying more than the ‘normal’ price to obtain more of the scarce resource because of the contribution foregone by not being able to satisfy the sales demand.

Therefore, if more critical (scarce) resource becomes available, then the feasible region would tend to expand and this means that the optimal point would tend to move outward away from the origin, thus earning more contribution.

Hence the shadow price of a binding constraint is the amount by which the total contribution would increase **if one more unit of the scarce resource** became available.

Management can use the shadow price as a measure of how much they would be willing to pay to gain more of a scarce resource over and above the normal price subject to any non-financial issues that may be present.

If the availability of a non-critical scarce resource increased then the feasible region would not tend to expand and therefore no more contribution could be earned. In this case, extra **non-critical scarce resource** has no value and a **nil shadow price**.

Calculating shadow prices

1. add one unit to the constraint concerned while leaving the other critical constraint unchanged

2. solve the revised simultaneous equations to derive a new optimal solution

3. calculate the revised optimal contribution and compare to the old contribution.

   The increase in contribution is the shadow price for the constraint under consideration.

Illustration

Following from the previous illustration, find the shadow price of Material X.

20A + 30B = 3001 (add 1 kg to Material X)
15A + 50B = 2700

20A + 30B = 3001 ….. x5
15A + 50B = 2700 ….. x3

100A + 150B = 15005
minus 45A + 150B =   8100

Totals   55A /   =   6905

A   =   125.55

100 A   + 150B = 15005
100(125.55) + 150B = 15005

B = 16.33

Therefore New Contribution =
20 (125.55) + 45 (16.33)

= 2511+ 734.85
= 3245.85

Old Contribution = 3245.20

Shadow price = 0.65

Extra contribution / kg of Material X

Slack and its Implications for Decision-Making and Performance Management

Slack

Slack occurs when the maximum availability of a resource is not used.

Therefore, slack is the amount by which a resource is **under-utilised**. It will occur when the optimum point does not fall on the given resource line.

If, at the optimal solution, the resource used **equals** the resource available, the constraint is binding and there is **no slack**.

Hence, a shadow price has to be calculated.

What happens if the objective is to minimise costs?

1. Same steps as above
2. Check the constraints :- are they less than or greater than?
3. If they are ‘greater than’, the region which you should consider is above the constraint.
4. The optimal point will be the first point you reach on the feasible region when you shift out the iso-cost function.

Syllabus C4. Pricing Decisions

Factors Influencing Pricing

Different Types of Market Structures

The price that a business can charge for its products or services will be determined by the type market in which it operates.

Perfect markets

In a **perfectly competitive market**, the firm is a **‘price taker’**, i.e. it takes its price from the industry. No market participant influences the price of the product it buys or sells.

Perfectly competitive markets exhibit the following characteristics:

- There are no barriers to entry into or exit out of the market.

- There is perfect knowledge, with no information failure or time lags. Knowledge is freely available to all participants, which means that risk-taking is minimal and the role of the entrepreneur is limited.

- Firms produce homogeneous, identical, units of output that are not branded.
- Each unit of input, such as units of labour, are homogenous.

- No single firm can influence the market price, or market conditions. The single firm is said to be a price taker, taking its price from the whole industry.

- There are a very large numbers of firms in the market.

- There is no need for government regulation, except to make markets more competitive.

- There are assumed to be no externalities, that is no external costs or benefits.

- Firms can only make normal profits in the long run, but they can make abnormal profits in the short run.

Imperfect markets

Imperfect competition refers to the market structure that does not meet the conditions of a perfect competition.

Its forms include:

- **Monopoly**, there is only one provider of a good or service.

  The monopolist sells a product for which there are no close substitutes.

  It controls the market and has great market power.

  It can set the price of products sold in the market.

- **Oligopoly**, a few large companies dominate the market and are inter-dependent.

  They offer the same product and compete for market dominance eg. Telecommunication costs.

- **Monopolistic competition**, products are similar, but not identical.

  Each firm sells a branded product, hence it is a monopolist for its brand.

  There is freedom of entry or exit into the industry.

What influences the price of a product or a service?

It is a fundamental rule of business that selling price must be greater than cost.

The most basic point about pricing is that in the long run, the revenue earned from selling a product or service must exceed the costs incurred.

1. **Cost**: - The most straightforward approach to arrive at the selling price is to calculate cost and add on a profit margin/mark up. Using this cost plus pricing approach, 'cost' is calculated on the basis of either marginal (this may also be termed 'variable') cost or total cost.

2. **Price perception**: - Customer-based pricing reflects customers' perceptions of the benefits they will enjoy if they obtain that product or service. Quality is an important aspect of price perception.

3. **Competition**: - Competition-based pricing means setting a price based upon the prices of competing products, i.e. taking into consideration both substitutes and complimentary products. However, it is important to remember that in many instances, the price will be dictated by the market. If the product or service is provided by a number of competitors, and it is not possible to differentiate between different providers, organisations will have little influence on prices.

4. **Inflation**: - In periods of inflation, a company may need to increase the price of its products and services to offset the increases in the prices of materials, labour and overheads.

5. **Innovation**: - A company may set a high price for an innovative product – price skimming.

6. **Ethics**: - When setting a price, the company will take into account various ethical considerations: if the product is scarce, should it rise its price to exploit these short-term shortages?

Price Elasticity of Demand

Price Elasticity

Generally, it is expected that there will be an **inverse relationship** between selling price and sales demand.

If the selling price is increased, sales demand would be expected to fall.

If the selling price is reduced, sales demand would be expected to rise.

The key question is ‘to what extent is demand likely to respond to a change in price?’

The **price elasticity of demand** (i.e. the degree of sensitivity of demand for a product to changes in the price of that product) can be measured as:

% change in sales demand

% change in selling price

If the % change in demand > the % change in price then price elasticity > 1.
Demand is **‘elastic’**, i.e. very responsive. Total revenue increases when price is reduced, and decreases when price is increased.

If the % change in demand < the % change in price, then price elasticity < 1.
Demand is **‘inelastic’**, i.e. not very responsive. Total revenue decreases when price is reduced, and increases when price is increased.

Price elasticity of 1 will mean that the % change in demand offsets the % change in price, leaving total sales revenue unchanged. An increase in selling price will be offset by a decrease in sales demand: a decrease in selling price will be offset by an increase in sales demand.

Illustration

At a price of \$1.50, annual demand is 100,000.

If price is increased to \$1.75, annual demand is 80,000

Price elasticity of demand is: -

% change in demand = 20,000/100,000 x 100 = -20%

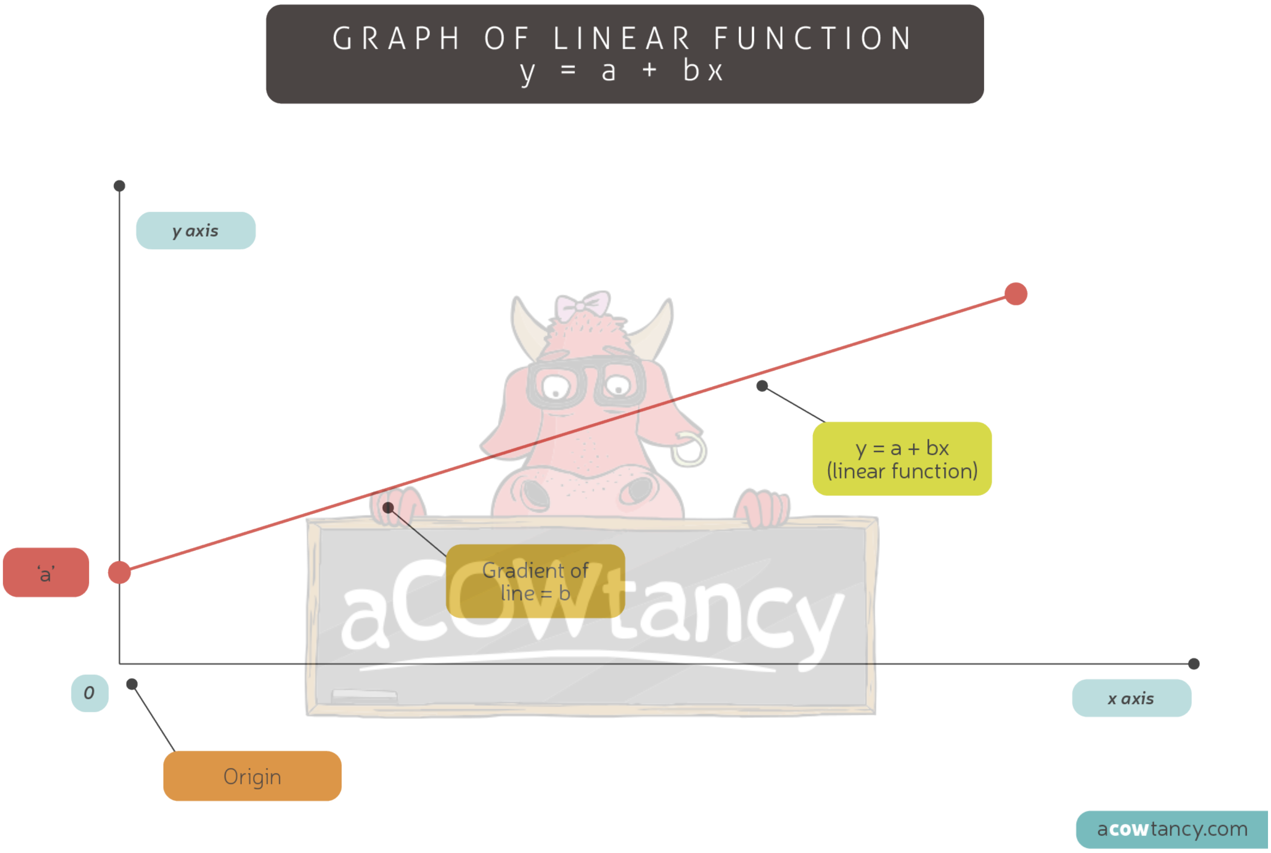
% change in price = 0.25/1.50 x 100 = 16.67%

Price elasticity of demand is 20/16.67 = **1.2** (ignore the minus sign)

The Straight Line Demand Equation

Equation of a straight-line

The equation of a straight line is represented by the following equation: -



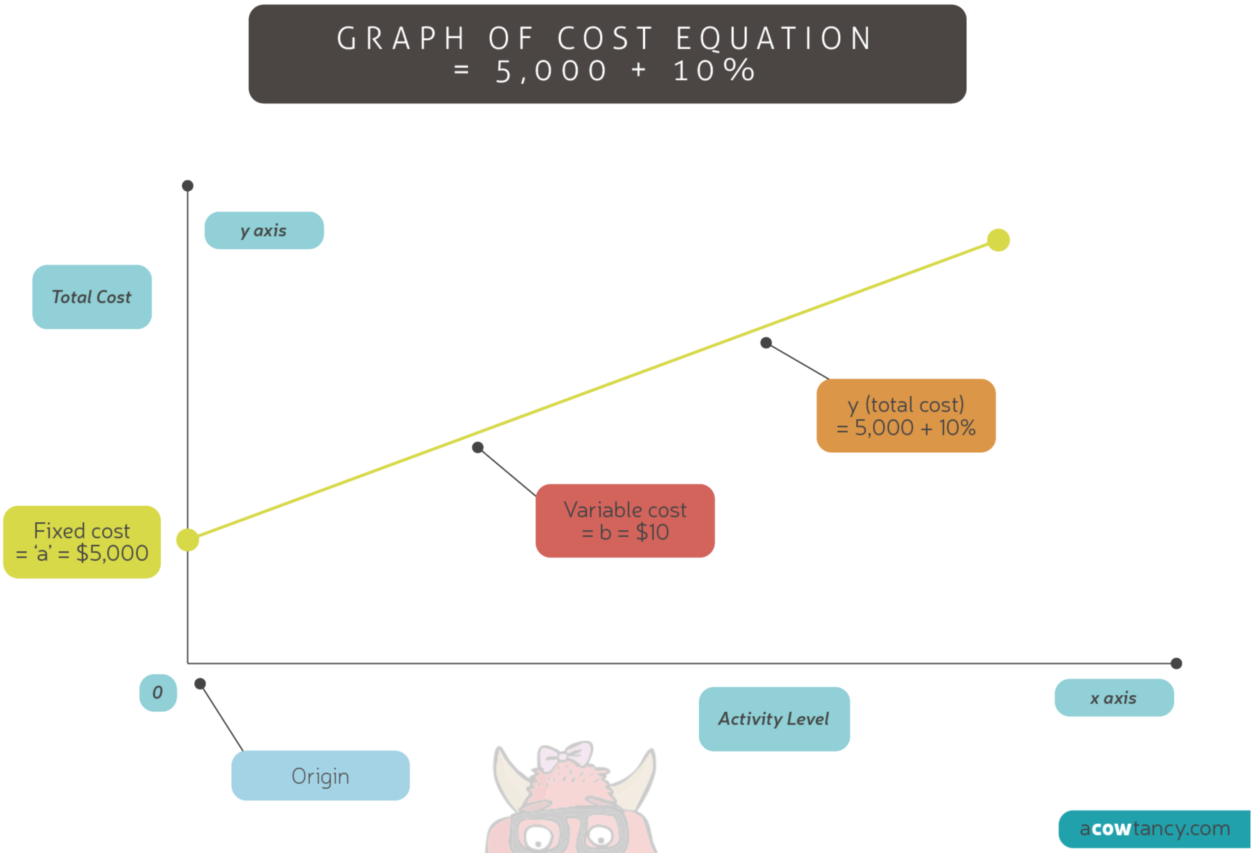
The gradient of the line =

ΔP = -b

ΔQ

Total cost function

The total cost function is linear: -



'a' is the fixed cost per period

'b' is the variable cost per unit

'x' is the activity level

'y' is the total cost = fixed cost + variable cost

Cost equations including volume-based discounts

Suppliers often offer discounts to encourage the purchase of increased volumes.

Where volume-based discounts are offered, a total cost equation can be derived for each volume range.

Illustration

Variable Cost: \$5 up to 10,000 units. 10% discount applies on all units purchased over 10,000 units.

Total Fixed Costs: \$100,000

$x \leq 10{,}000$, TC = 100,000 + 5x

$x \geq 10{,}001$, TC = 100,000 + 4.5x

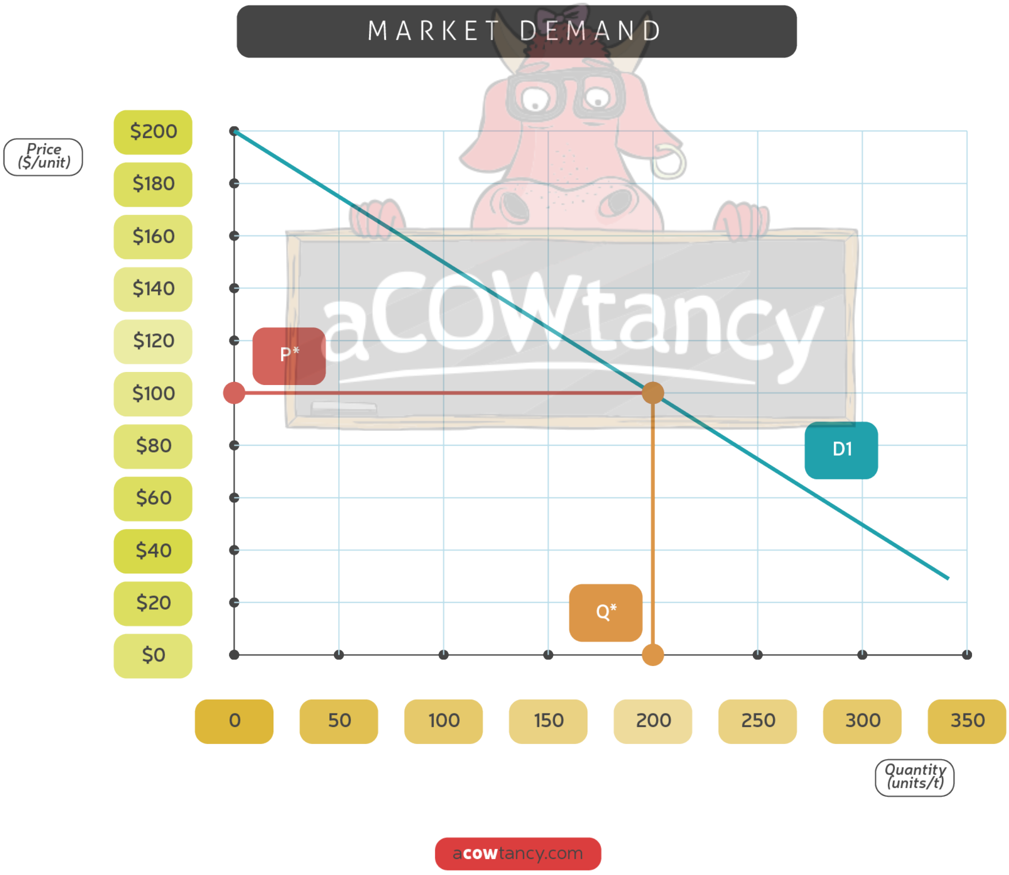
The Optimum Selling Price and Quantity

Demand-based approaches (the economists' viewpoint)

Most firms recognise that there exists a relationship between the selling price of their product or service and the demand.

The law of demand explains the inverse relation between quantity and price in general. It can be stated as follows:

"Ceteris Paribus (other things remaining equal), the quantity of a good demanded will rise (expand) with every fall in its price and the quantity of a good demanded will fall (contract) with every rise in its price."



The price-demand equation is in the form:

P = a - bQ

Where

P is the selling price

Q is the quantity demanded at that price

a = theoretical maximum price (if price is set at ‘a’ or above, demand will be zero), i.e. from the graph above, at a price of $200, demand is zero.

b = the change in price required to change demand by 1 unit (the gradient of the line) = $\Delta P / \Delta Q$

Profit Maximisation – Algebraic Approach

Economic theory states that, in a perfectly competitive market, the monopolist maximises profit when

marginal revenue = marginal cost.

Marginal revenue (MR) is the extra revenue that an additional unit of product will bring. It is the additional income from selling one more unit of a good. It can also be described as the change in total revenue divided by the change in the number of units sold.

It is very important to note that the gradient of MR function is twice the gradient of the demand function: -

$MR = a - 2bQ$

Marginal cost is the change in total cost that arises when the quantity produced changes by one unit. That is, it is the cost of producing one more unit of a good.

EXAMPLE

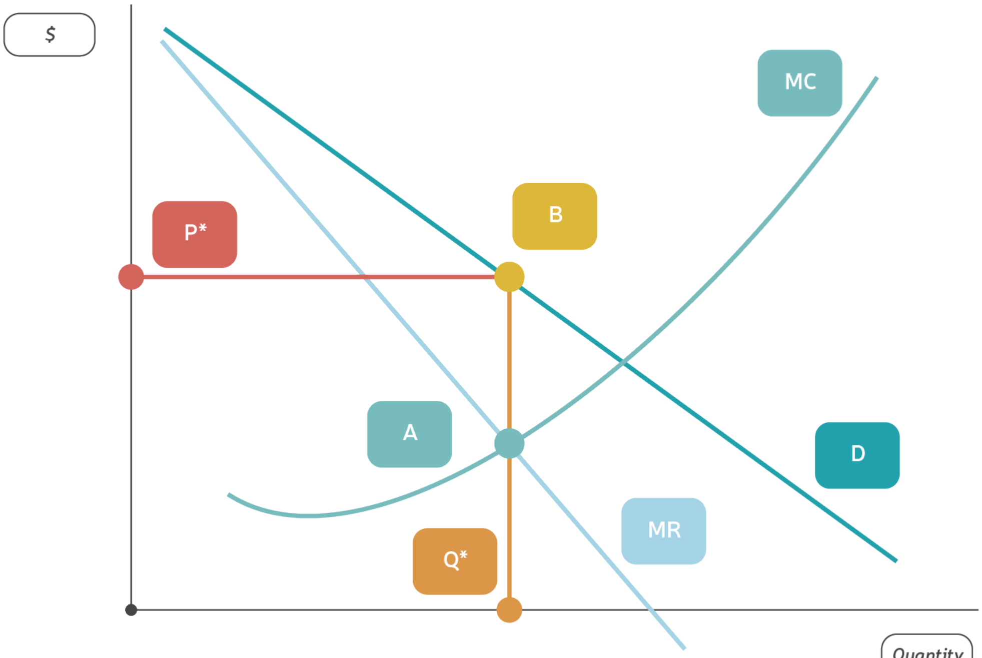
UNITS	TOTAL COST	COST/UNIT	MARGINAL COST	TOTAL REVENUE	PRICE	MARGINAL REVENUE	PROFIT
1	30	30.0	30	35	35.0	35	5
2	55	27.5	25	65	32.5	30	10
3	77	25.7	22	93	31.0	28	16
4	97	24.2	20	116	29.0	23	19
5	116	23.2	19	138	27.6	22	22
6	134	22.3	18	156	26.0	18	22
7	151	21.6	17	170	24.3	14	19
8	168	21.0	17	182	22.8	12	14
9	184	20.4	16	193	21.4	11	9
10	200	20.0	16	203	20.3	10	3

Profits are maximised when MC = MR; in this case, when 6 units are produced, MC = MR at $18 and total profit is $22.

At point A, MC = MR, i.e. profits are maximised at this point.

At output less than Q, the extra cost of making a unit is less than the extra revenue from selling it.

At output greater that Q, the extra costs of making a unit exceed the revenue from selling it.



Illustration

A company is considering the price of a new product.

It has determined that the variable cost of making the item will be $24 per unit.

Market research has indicated that if the selling price were to be $60 per unit then the demand would be 1,000 units per week.

However, for every $10 per unit increase in selling price, there would be a reduction in demand by 50 units and for every $10 reduction in selling price, there would be an increase in demand of 50 units.

Calculate the optimal selling price.

Note: If Price P = a – bx then Marginal Revenue = a – 2bx

$P = a - bQ$

$b = \frac{\Delta P}{\Delta Q} = \frac{10}{50} = 0.2$

$60 = a - 0.2\,(1000)$

$a = 260$

$P = 260 - 0.2Q$

$MR = 260 - 0.4Q$

If $MC = MR$

$24 = 260 - 0.4Q$

$0.4Q = 236$

$Q = 590$

$P = 260 - 0.2\,(590)$

$= \$142$

acowtancy.com

Evaluating a Decision to increase Production and Sales

Cost-plus

Cost-plus pricing involves establishing the unit cost and adding a **mark-up** or sales **margin**.

Full cost-plus pricing is a method of determining the sales price by calculating the full cost of the product and adding a percentage mark-up for profit.

- **Advantages of full cost-plus pricing**
    - It is a quick, simple and cheap method of pricing which can be delegated to junior managers.
    - Since the size of the profit margin can be varied, a decision based on a price in excess of full cost should ensure that a company working at normal capacity will cover all of its fixed costs and make a profit.
- **Disadvantages of full cost-plus pricing**
    - It fails to recognise that since demand may be determining price, there will be a profit maximising combination of price and demand.
    - There may be a need to adjust prices to market and demand conditions.
    - Budgeted output volume needs to be established. Output volume is a key factor in the overhead absorption rate.
    - A suitable basis for overhead absorption must be selected, especially where a business produces more than one product.
    - There is no attempt to establish optimum price

Different Price Strategies

Cost-plus

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- **Disadvantages of full cost-plus pricing**

    1. It fails to recognise that since demand may be determining price, there will be a profit maximising combination of price and demand.
    2. There may be a need to adjust prices to market and demand conditions.
    3. Budgeted output volume needs to be established. Output volume is a key factor in the overhead absorption rate.
    4. A suitable basis for overhead absorption must be selected, especially where a business produces more than one product.
    5. There is no attempt to establish optimum price.

Marginal cost-plus pricing/mark-up pricing

Marginal cost-plus pricing/mark-up pricing involves adding a profit margin to the marginal cost of production/sales.

- **Advantages of marginal cost-plus pricing**
    1. It is a simple and easy method to use.
    2. The mark-up percentage can be varied, and so mark-up pricing can be adjusted to reflect demand conditions.
    3. It draws management attention to contribution, and the effects of higher or lower sales volumes on profit.
    4. In practice, mark-up pricing is used in businesses where there is a readily-identifiable basic variable cost.
- **Disadvantages of marginal pricing**
    1. Although the size of the mark-up can be varied in accordance with demand conditions, it does not ensure that sufficient attention is paid to demand conditions, competitors' prices and profit maximisation.
    2. It ignores fixed overheads in the pricing decision, but the sales price must be sufficiently high to ensure that a profit is made after covering fixed costs.

Market Skimming

Essentially this strategy is used to achieve high unit profits in the early stages of a product’s life cycle.

This is done by charging a **high price on entry** to the market and stimulating demand through advertising and promotion.

Customers are prepared to pay high prices in order to gain the perceived status of owning the product early.

This would enable the company to take advantage of the unique nature of the product, thus maximising sales from those customers who like to have the latest technology as early as possible.

- **The most suitable conditions for this strategy are:**
    - the product is new and different.
    - the product has a short life cycle and high development costs that need to be recovered quickly
    - high prices in the early stages of a product's life cycle are expected to generate high initial cash inflows.
    - since high prices attract competitors, there needs to be barriers to entry in order to deter competitors.
    - the strength and sensitivity of demand are unknown.

As the product enters the later stages of its life cycle, the price will be reduced.

The approach essentially **'skims'** the profit in the early stages of the life cycle before increased competition leads to lower prices.

One example of market skimming is digital cameras. When these were introduced, the initial selling price was high.

The manufacturers sought to build profit early in the product life cycle - and to recover the development costs over a relatively short period.

Penetration Pricing

Market penetration is the term used to describe a policy in which the **initial price is set at a lower level** to build a strong market share, and is more likely to be successful when demand is elastic.

The price will make the product accessible to a larger number of buyers and therefore the high sales volumes will compensate for the lower prices being charged.

This allows economies of scale to be built rapidly so that unit costs can be reduced.
A penetration policy is used to discourage new entrants from entering the market.

It will shorten the initial period of a product's life cycle in order to enter the growth and maturity stages quickly.

Complementary Product

A complementary product is one that is used in conjunction with another product. For example, tennis balls and tennis rackets, razors and blades, printers and printer cartridges.

- **A complementary pricing strategy can take two forms:**

    1. The major product e.g. a printer is set at a relatively low price. Why? To encourage the consumer to purchase the low-value item and then he will be locked into subsequent purchases with higher prices eg. Cartridges.

    2. The major product is priced at a relatively high figure. Hence the consumer is locked into subsequent low-value. This happens in the case of gym memberships.

Product-line pricing

A product line is a range of products that are intended to meet similar needs of different target audiences. The products within the product line are related but may vary in style, colour and quality.

- Within the product mix or line, there are typically price points that reflect the price level: high, medium or low.

  For example, most computer manufacturers have basic models, business models and premium high graphic and/or gaming models. Each of those model levels has its own price point. Automotive manufacturers have economy models, environmental models, luxury models, work models, and more.

Volume discounting

Customers are offered a lower price per unit if they purchase a particular quantity of products.

- **There may be two types of discounts:**

    1. Quantity discounts – for customers that order large quantities.

    2. Cumulative quantity discounts – the discount increases as the cumulative quantity ordered increases.

Volume discounting is applied to products with a limited shelf life, e.g. fashion items and also to clear unpopular items.

The discounts discourage the customers from trying out new suppliers as the cumulative quantity discounts ‘lock in’ the customer. Further purchases can be made at a lower cost per unit.

Price-discrimination

Price-discrimination occurs where a company sells the **same products** at **different prices** in **different markets**.

- **This is possible if:**
  1. the seller can determine the selling price.
  2. customers can be segregated into different markets.
  3. customers cannot buy at the lower price in one market and then they sell at the higher price in the other market
  4. in each market, price elasticity of demand must be different :- in one market, prices can be increased and in the other market lowered so as to increase sales revenue.

Relevant costing

For short-term decisions, the incremental costs of accepting an order should be presented. Bids should then be made at prices that exceed incremental costs.

For short-term decisions many costs are likely to be fixed and irrelevant.

- **Short-term pricing decisions should meet the following conditions:**
  1. spare capacity should be available for all of the resources that are required to fulfil and order;
  2. the bid price should represent a one-off price that will not be repeated for future orders; and
  3. the order will utilise unused capacity for only a short period and capacity will be released for use on more profitable opportunities.

For long-term decisions, a firm can adjust the supply of virtually all of the resources.

Therefore, cost information should be presented providing details of all of the resources that are committed to a product or service. Since fixed costs should be covered in the long-term by sales revenues there are strong arguments for allocating such costs for long-run pricing decisions.

To determine an appropriate selling price, a mark-up is added to the total cost of the resources assigned to the product/service to provide a contribution to profits.

Syllabus C5. Make-or-Buy and Other Short-Term Decisions

Outsourcing

Outsourcing

This is contracting out aspects of the work of the organisation, previously done in house, to specialist providers.

Business process outsourcing (BPO) is a subset of outsourcing and involves the contracting out of specific business functions such as IT or HR.

Matters to be considered:

1. **Quality** The quality of the outside producer must be acceptable
2. **Continuity of supply** must be guaranteed
3. Can the **extra capacity** freed up generate additional profits
4. Will labour morale will be adversely affected?

Make or Buy Decisions

A key consideration here is spare capacity

If Spare production capacity is available

So here we have spare room to MAKE more products, therefore…

- **Production resources may be idle** (if the component is purchased from outside)
- **Fixed costs are irrelevant** (because we won't need any extra fixed costs)
- So just consider the **variable costs of MAKING** compared to the **purchase cost of BUYING**

Decision

1. **Buy**
   If buying price < the variable costs of making

2. **Make**
   If buying price > variable costs of making

No spare capacity available?

So we need to buy more space or stop making something to create space

- Stopping making something to create capacity causes lost contribution

- So compare the contribution lost + extra costs of MAKING to the purchase price of BUYING

Decision

1. **Buy**
   if relevant costs of making > Purchase price
2. **Make**
   if relevant costs of making < Purchase price

Illustration

Craft Ltd makes four components A, B, C, and D and the associated annual costs are as follows:

	A	B	C	D
Production volume (units)	1,500	3,000	5,000	8,000
Unit variable costs	$	$	$	$
Direct Materials	4	4	5	5
Direct Labour	8	8	6	6
Variable production overheads	2	1	4	5
Total	14	13	15	16
Fixed costs directly attributable are:	3,000	6,000	10,000	7,000
The unit prices of an external supplier are:	12	16	20	24

Determine whether any of the components should be bought in from the external supplier.

	A	B	C	D
Costs if Made	14	13	15	16
Costs if Bought	(12)	(16)	(20)	(24)
Savings per unit Bought	2	(3)	(5)	(8)
Number of units	1,500	3,000	5,000	7,000
Total Savings if Bought	3,000	(9,000)	(25,000)	(56,000)
Plus Direct Fixed Costs Saved	3,000	6,000	10,000	7,000
Total Saving	6,000	(3,000)	(15,000)	(49,000)

Therefore only buy in component A as this is the only one which makes a saving if bought in

Close or Continue

Closure or continuation decisions

Here you need to look at:

1. The loss in revenue from closing down the operation, and
2. The saving in costs from closing down (= avoidable costs).

This basically means look at its contribution - so make sure all the costs are direct - otherwise they wont be saved

Illustration

The management of Oh no It's all going wrong!

Co is considering the closure of one of its operations (department 2) and the financial accountant has submitted the following report.

Department	1	2	3	Total
Sales (units)	10,000	5,000	15,000	30,000
Sales ($)	150,000	92,000	158,000	400,000
Direct material	75,000	75,000	50,000	200,000
Direct labour	25,000	25,000	10,000	60,000
Production overhead	5,000	2,500	7,500	15,000
Gross profit	45,000	-10,500	90,500	125,000
Expenses	-15,000	-9,200	-15,800	-40,000
Net profit ($)	30,000	-19,700	74,700	85,000

In addition to the information supplied above, you are told that:

Production overheads of $15,000 have been apportioned to the three departments on the basis of unit sales volume

Expenses are head office overhead, apportioned to departments on sales value.

As management accountant, you further ascertain that, on a cost driver basis:

Half of the so-called direct labour is fixed and cannot be readily allocated.

Prepare a report for management including a restatement of the financial position in terms of contribution made by each department and making a clear recommendation.

	1	2	3	Total
Sales	150,000	92,000	158,000	400,000
Direct Materials	(75,000)	(75,000)	(50,000)	(200,000)
Direct Labour	(12,500)	(12,500)	(5,000)	(30,000)
Production Overheads	(5,000)	(2,500)	(7,500)	(15,000)
Contribution	57,500	2,000	95,500	155,000

As Department 2 makes a positive contribution it should not be closed down

Shut down decisions

- Loss of contribution from the segment
- Savings in specific fixed costs from closure
- Penalties resulting from the closure, e.g. redundancy, compensation to customers
- Alternative use for resources released
- Knock-on impact, e.g. loss leaders cancelled - products that got customers into the store

Research Techniques to Reduce Uncertainty

Risk & Uncertainty

Risk refers to the situation where probabilities can be assigned to a range of expected outcomes arising from an investment project and the likelihood of each outcome occurring can therefore be quantified.

For e.g., based on past experience, a sales team may estimate it has a 60% chance of winning a particular contract.

Uncertainty refers to the situation where probabilities cannot be assigned to expected outcomes. Investment project risk therefore increases with increasing variability of returns, while uncertainty increases with increasing project life.

For e.g., it is very difficult to assign probabilities to a new product entering into a market The two terms are often used interchangeably in financial management, but the distinction between them is a useful one.

Risk Management is the process of understanding and managing the risks that the organisation will inevitably meet in attempting to achieve its objectives.

Market Research

Market research assesses and reduces uncertainty about the likely responses of customers to new products, new advertising campaigns, price changes, etc.
This can be desk-based (secondary) or field-based (primary).

Desk-based research is cheap but can lack focus. It is collected from secondary sources, i.e. published and other available sources of information.

Field-based research is research by direct contact with a targeted group of potential customers. It is better than desk-based research in that you can target your customers and your product area.

However, it can be time consuming and expensive. The internet is bringing down the cost and speeding up this type of research, email is being used to gather information quickly on the promise of free gifts etc.

Field-based research can be either:

1. **Motivational research**

   – the objective is to unearth factors why consumers do or do not buy particular products. Depth and group interviewing techniques are used in motivational research.

2. **Measurement research**

   – the objective is to build on the motivation research by trying to quantify the issues involved. Sample surveys are used to find out how many people buy the products, in what quantity, from where and when.

Focus Groups

Focus groups are a form of market research. They are small groups (typically eight to ten individuals) selected from a broader population who are interviewed through discussions in an informal setting.

They are questioned in order to gather their opinions and reactions to a particular subject or marketing-orientated issues, known as test concepts

These focus groups can provide market researchers with much helpful information. However, it is difficult to measure the results objectively.

Their cost and logistical complexity is frequently cited as a barrier, especially for smaller companies.

Focus groups have been used by banks to assess consumer reactions to new electronic banking products and by television companies to obtain voters' reactions to political elections.

The Use of Simulation, Expected Values and Sensitivity

Simulation

Simulation is a modelling technique used mainly in capital investment appraisal decisions. Computer models can be built to simulate real life scenarios. The model will predict what range of returns an investor could expect from a given decision without having risked any actual cash.

The models use random number tables to generate possible values for the uncertainty the business is subject to.

Since the time and costs involved can be more that benefits gained, computer technology is assisting in bringing down the cost of such risk analysis.

Models can become extremely complex and probability distributions may be difficult to formulate.

Expected Values (EV)

The ‘expected value’ rule calculates the average return that will be made if a decision is repeated again and again.

It does this by weighting each of the possible outcomes with their relative probability of occurring.

It is the weighted arithmetic mean of the possible outcomes.

The likelihood that an event will occur is known as its probability.

This is normally expressed in decimal form with a value between 0 and 1.
A value of 0 denotes a nil likelihood of occurrence whereas a value of 1 signifies absolute certainty.

A probability of 0.4 means that the event is expected to occur four times out of ten.

The total of the probabilities for events that can possibly occur must sum up to 1.0.

$EV = \sum px$

Where:
p = probability of the outcome
x= the possible outcome

A risk neutral investor will generally make his decisions based on maximising EV.

An expected value is computed by multiplying the value of each possible outcome by the probability of that outcome, and summing the results.

Sensitivity Analysis

Sensitivity analysis can be used to assess the range of values that would still give the investor a positive return.

It is a technique which is similar to the ‘what if?’ scenario.

The uncertainty may still be there, but the effect that it has on the investor’s returns will be better understood.

Sensitivity calculates the % change required in individual values before a change of decision results.

If only a (say) 2% change is required in selling price before losses result, an investor may think twice before proceeding.

Therefore, sensitivity analysis assesses how the net present value of an investment project is affected by changes in project variables.

Considering each project variable in turn, the change in the variable required to make the net present value zero is determined, or alternatively the change in net present value arising from a fixed change in the given project variable.

In this way the key or critical project variables are determined.

However, sensitivity analysis does not assess the probability of changes in project variables and so is often dismissed as a way of incorporating risk into the investment appraisal process.

Applying Expected Values and Sensitivity to Decision-Making Problems

Decision-Making Problems

Illustration 1

economic state	probability	project a	project b	project c
good	0.25	US$140000	US$95000	US$30000
average	0.45	US$90000	US$80000	US$60000
poor	0.30	(US$20000)	US$82000	(US$8000)
expected value =	∑px	**project a**	**project b**	**project c**
		(140000 x 0.25)	(95000 x 0.25)	(30000 x 0.25)
good		US$35000	US$23750	US$7500
average		US$40500	US$36000	US$27000
poor		(US$6000)	US$24600	(US$2400)
		----------	----------	----------
		US$69500	US$84350	US$32100
		----------	----------	----------

Project B should be chosen as it maximises EV at $84,350

Illustration 2

Two possible outcomes for a process:-

probability	**outcome**
0.4	loss of $20,000
0.6	profit of $40,000

(i) Expected Value

EV = ∑px

outcome	**probability**	**∑px**
(x)	(p)	
(20000)	0.4	(8000)
40000	0.6	24000
		-------
	ev =	16000

Should the process be undertaken?

Yes, it has a positive expected value

(ii) What level of loss would lead this process not to be undertaken?

The decision will change if EV from the process is ‘0’ – i.e. break-even.

Loss x 0.4 = 40,000 x 0.6
= 24,000

0.4 Loss = 24,000

Loss = 24,000

0.4

= 60,000

If the loss from the process is more than $60,000, the process will not be under taken.

Maximax, Maximin and Minimax Regret

Attitudes to risk by individuals

How do we determine whether or not a risky course of action should be undertaken?

This depends on the decision-maker's attitude to risk.

There are 3 possible attitudes:

1. an aversion to risk
2. a desire for risk
3. an indifference to risk

A **risk-seeker** is one who, given a choice between more or less risky alternatives with identical expected values, prefers the riskier alternative.

Faced with the same choice, a **risk-averter** would select the less risky alternative.

The person who is indifferent to risk **(risk neutral)** would be indifferent to both alternatives because they have the same expected values.

Maximax

The maximax rule applies to an optimist (risk-seeker) who seeks to maximise the maximum possible gain of possible outcomes.

Maximin

The 'maximin' decision rule looks at the worst possible outcome at each supply level and then selects the highest one of these.

It is used when the outcome cannot be assessed with any level of certainty.

The decision maker therefore chooses the outcome which is guaranteed to minimise his losses.

In the process, he loses out on the opportunity of making big profits.

It is often seen as the pessimistic approach to decision-making (assuming that the worst outcome will occur) and is used by decision makers who are risk averse. It can be used for one-off or repeated decisions.

Minimax Regret Rule

The minimax regret strategy minimises the maximum regret.

‘Regret’ means the opportunity loss from having made a wrong decision.

Decision Trees

Decision Tree

A useful analytical tool for clarifying the range of alternative courses of action and their possible outcomes is a decision tree.

A decision tree is a diagram showing several possible courses of action and possible events and the potential outcomes for each course of action.

For e.g. deciding whether to expand the business or not.

There are two main stages to making decisions using decision trees:

1. The decision tree is drawn and all probabilities and outcome values are included.

2. Evaluation and recommendation stage: all expected values are calculated at all outcome points and these are used to make decisions.

   A course of action is then recommended.

1) Constructing the decision tree

Draw the tree from left to right, showing appropriate decisions and events /outcomes. A square is used to represent a decision point (i.e. where a choice between different courses of action must be taken – within your control).

A circle is used to represent a chance/outcome point.

Outcomes are not within your control.

They depend on the external environment, e.g. customers, suppliers and the economy.

Each alternative course of action or event is represented by a branch.

The branches have probabilities attached to them.

All decision trees must start with a ‘square’, representing a decision.

Figure 1:

There are two branches coming off the decision point.

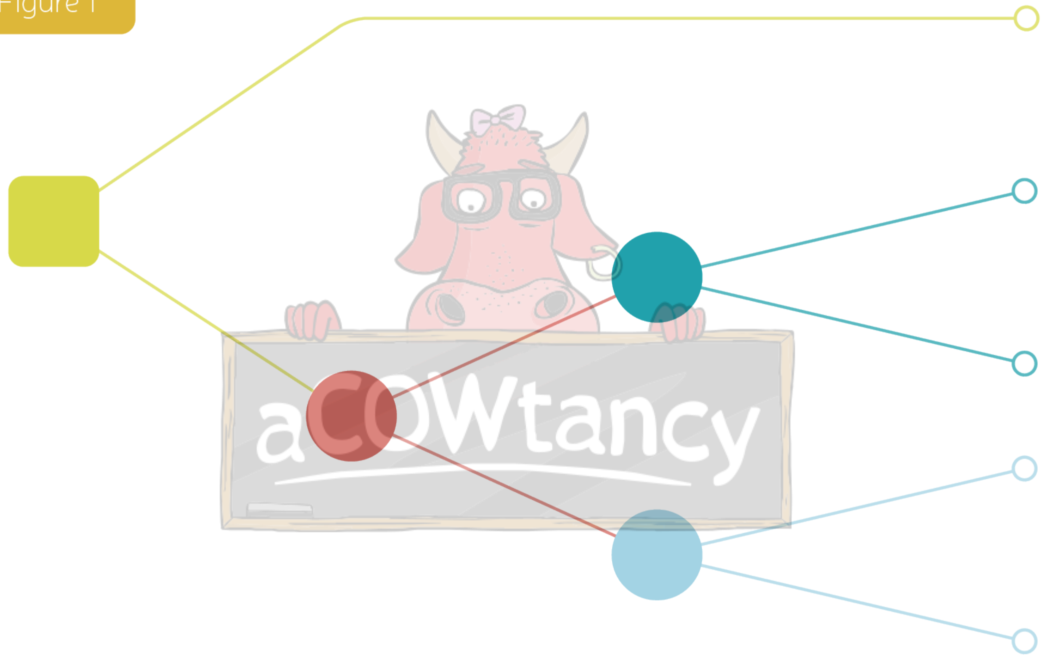
The outcome of one of these choices (the top branch) is certain.

However, the lower branch shows that there are two possible outcomes.

There are two more sets of outcomes for these initial outcomes.

Once the tree has been drawn, label the tree and relevant cash inflows/outflows and probabilities associated with outcomes. Probabilities will add up to '1' or 100%.

Figure 1



2) Evaluation of the decision

Evaluate the tree from right to left (in the opposite direction to when the tree was drawn).

- Calculate an EV at each outcome point by applying the probabilities to the cashflows.
- Choose the best option at each decision point.
- Finally, a recommendation should be made to management, based on the option that gives the highest expected value.

The Value of Perfect and Imperfect Information

The Value of Perfect and Imperfect Information

When a decision-maker is faced with a series of uncertain events that might occur, he or she should consider the possibility of obtaining additional information about which event is likely to occur.

Perfect information is available when a 100% accurate prediction can be made about the future.

Imperfect information The concept of perfect information is somewhat artificial since, in the real world, such perfect certainty rarely, if ever, exists.

For example, predictions for future demand may only be 80% reliable.

Hence, the value of imperfect information will always be less than the value of perfect information.

The approach to calculate the value of perfect and imperfect information is the same:

- compare the expected value of a decision if the information is acquired against the expected value with the absence of the information.
-

The difference represents the maximum amount it is worth paying for the additional information.

Therefore the value of information (either perfect or imperfect) may be calculated as follows:

Expected Profit (Outcome) WITH the information LESS Expected Profit (Outcome) WITHOUT the information.

Syllabus D: Budgeting And Control

Syllabus D1. Budgetary Systems

Budgetary Systems

Producing budgets

A **budget** is a quantitative detailed plan prepared for a specific time period. It is normally expressed in financial terms and prepared for one year.

Forecasting is a technique used to arrive at estimates based on judgment and experience.

The main objectives for producing budgets

1. ***To Compel Planning***

   One of the key purposes of a budgeting system is to require planning to occur so that the organisation's objectives are achieved.

2. ***To Co-ordinate Activities***

   Budgeting is a method of bringing together the activities of all the different departments into a common plan.

   If an advertising campaign is due to take place in a company in three months' time, it is important that the production department know about the expected increase in sales so that they can scale up production accordingly.

3. ***To Communicate Activities***

   The budgeting system facilitates communication within the organisation both vertically (for example between senior and junior managers) and horizontally (for example between different organisational functions).

4. ***To establish a system of control***

   One of the most important purposes of a budgeting system is to facilitate cost control through the comparison of budgeted costs and actual costs.

   Variances between budgeted and actual costs can be investigated in order to determine the reason why actual performance has differed from what was planned.

5. ***To motivate managers to perform well***

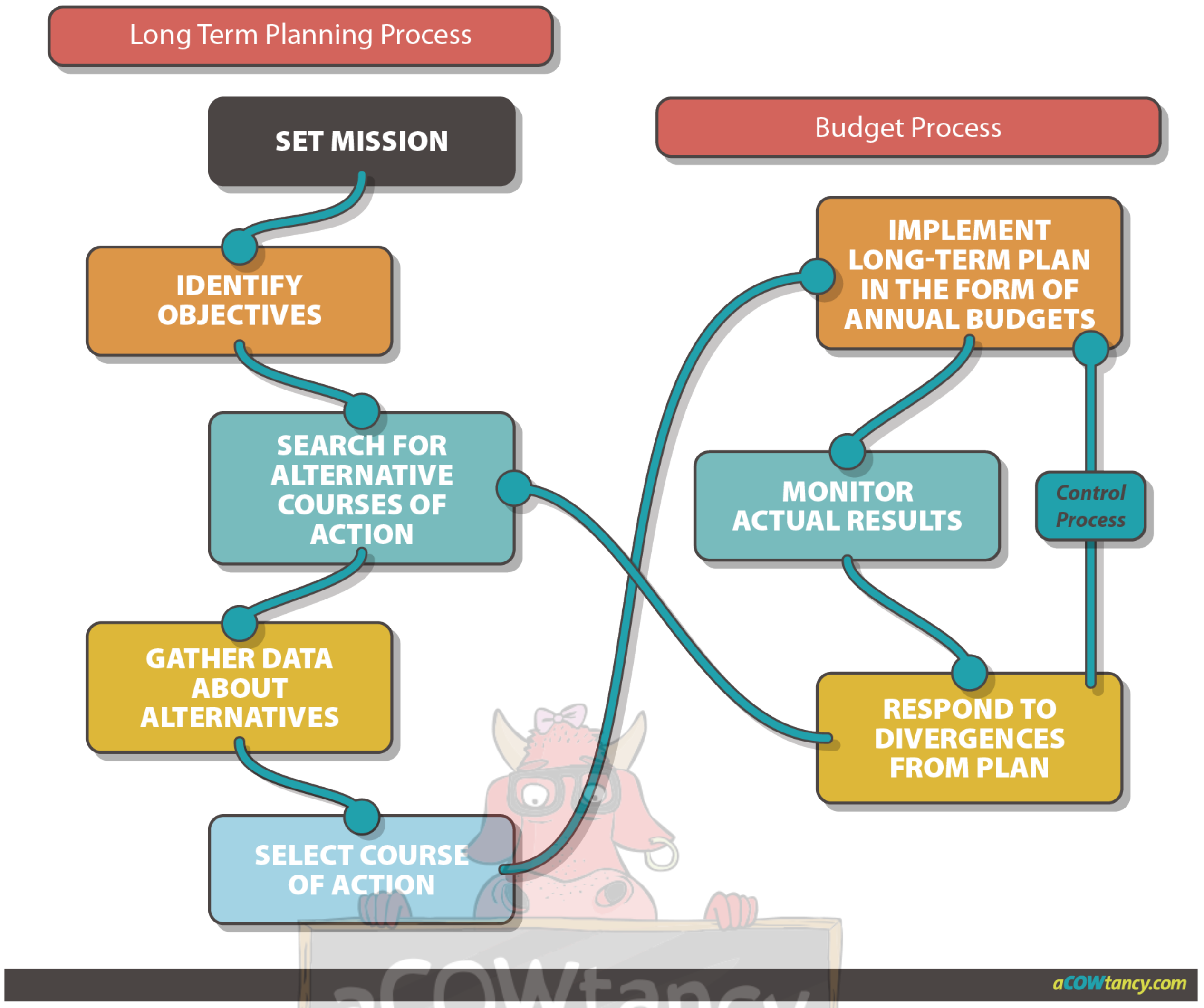
   The budgeting system can influence the behaviour of managers and employees, and may motivate them to improve their performance if the target represented by the budget is set at an appropriate level.

6. ***To evaluate performance***

   Managerial performance is often evaluated by the extent to which budgetary targets for which individual managers are responsible have been achieved – responsibility accounting.

   Managerial rewards such as bonuses or performance-related pay can also be linked to achievement of budgetary targets

The overall **planning and control cycle** is summarised in the diagram below:


Long Term Planning Process
SET MISSION
IDENTIFY OBJECTIVES
SEARCH FOR ALTERNATIVE COURSES OF ACTION
GATHER DATA ABOUT ALTERNATIVES
SELECT COURSE OF ACTION
Budget Process
IMPLEMENT LONG-TERM PLAN IN THE FORM OF ANNUAL BUDGETS
MONITOR ACTUAL RESULTS
Control Process
RESPOND TO DIVERGENCES FROM PLAN
aCOWtancy.com

The planning and control cycle

1. Set Mission

This involves establishing the broad overall aims and goals of the organisation – its mission may be both economic and social. Most organisations now prepare and publish their mission in a **mission statement.**

Mission statements often include the following information:

- Purpose and aim(s) of the organisation
- The organisation's primary stakeholders: clients/customers, shareholders, congregation, etc.
- How the organisation provides value to these stakeholders, for example by offering specific types of products and/or services

2. *Identify Objectives*

This requires the company to specify objectives towards which it is working. The objectives chosen must be quantified and have a timescale attached to them.

Objectives should be SMART

- **S**pecific
- **M**easurable
- **A**chievable
- **R**elevant
- **T**ime limited

3. *Search for possible courses of action*

A series of specific strategies should be developed. Strategy is the course of action, including the specification of resources required, that the company will adopt to achieve its specific objective.

To formulate its strategies, the firm will consider the products it makes and the markets it serves. E.g. of strategies are

- Developing new markets for existing products
- Developing new products for existing markets
- Developing new products for new markets

4. *Gathering data about alternatives and measuring pay-offs*

5. *Select course of action*

Having made decisions, long-term plans based on those decisions are created.

6. *Implementation of short-term (operating) plans*

This stage shows the move from long-term planning to short-term plans – the annual budget.

The budget provides the link between the strategic plans and their implementation in management decisions.

7. *Monitor actual outcomes*

Detailed financial and other records of actual performance are compared with budget targets (variance analysis).

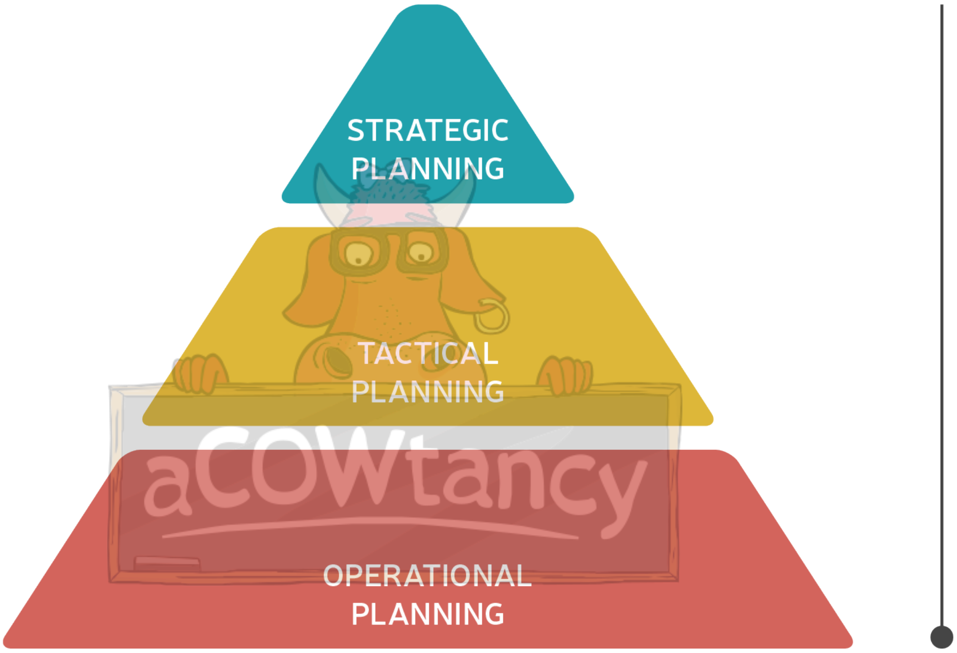
8. *Respond to divergences from plan*

This is the control process in budgeting, responding to divergences from plan either through budget modifications or through identifying new courses of action.

How budgetary systems fit within the performance hierarchy.

As discussed in point 6 above, budgets provide benchmarks against which to compare actual results. Through variance analysis, then the company needs to develop corrective measures. However, budgets need to be flexible in order to meet the changing needs of the business.

The Performance Hierarchy



Strategic Planning

Senior management formulate long-term (e.g. 5 to 10 years) objectives and plans for an organisation. Such plans include overall profitability, the profitability of different segments of the business, capital equipment needs and so on.

Tactical Planning

Senior management make medium-term, more detailed plans for the next year, for e.g. decide how the resources of the business should be employed, and to monitor how they are being and have been employed.

An example would be: - how many people should be employed next year?

Operational Planning

All managers are involved in making day-to-day decisions. 'Front-line' managers such as foremen or senior clerks have to ensure that specific tasks are planned and carried out properly within a factory or office.

Operational information is derived almost entirely from internal sources. It is prepared frequently and is highly detailed. It is mainly quantitative.

If a manager achieves operational plans, it is more likely of meeting the tactical objectives and ultimately the strategic goals.

How are planning and control inter-related?

Control involves measuring actual results and comparing them against the original plan. Any deviation from plan requires control action to make the results conform with the plan.

Types of Budgetary Systems

Rolling Budget

A rolling budget is sometimes called a continuous budget.

Here, a portion of the budget period is replaced on a regular basis so that the overall budget period remains unchanged.

For example, with a budget period of one year, at the end of each quarter a new quarter could be added to the end of the budget period and the elapsed quarter could be deleted, so that the budget will always be looking one year ahead.

A cash budget is often a rolling budget because of the need to keep tight control of this area of financial management.

A rolling budget is also supported by the availability of cheap and powerful information processing via personal computers and computer networks.

Advantages of rolling budgets

1. They reduce the element of uncertainty in budgeting because they concentrate detailed planning and control on short-term prospects where the degree of uncertainty is much smaller.

2. They force managers to reassess the budget regularly, and to produce budgets which are up to date in the light of current events and expectations.

3. Planning and control will be based on a recent plan which is likely to be far more realistic than a fixed annual budget made many months ago.

4. Realistic budgets are likely to have a better motivational influence on managers.

5. There is always a budget which extends for several months ahead.

   For example, if rolling budgets are prepared quarterly there will always be a budget extending for the next 9 to 12 months.

   This is not the case when fixed annual budgets are used.

Disadvantages of rolling budgets

1. They involve more time, effort and money in budget preparation.

2. Frequent budgeting might have an off-putting effect on managers who doubt the value of preparing one budget after another at regular intervals.

3. Revisions to the budget might involve revisions to standard costs too, which in turn would involve revisions to stock valuations.

   This could replace a large administrative effort from the accounts department every time a rolling budget is prepared.

Incremental Budget

Incremental budgeting is a process whereby this year's budget is set by reference to last year's actual results after an adjustment for inflation and other incremental factors.

It is commonly used because:

1. It is quick to do and a relatively simple process.

   This makes it possible for a person without any accounting training to build a budget.

2. The information is readily available, so very limited quantitative analysis is needed.

3. It is appropriate in some circumstances.

   For example, in a stable business, the amount of stationery spent in one year is unlikely to be significantly different in the next year, so taking the actual spend in year one and adding a little for inflation should be a reasonable target for the spend in the next year.

There are problems involved with incremental budgeting:

1. It builds on wasteful spending (inefficiencies).

   If the actual figures for this year include overspends caused by some form of error then the budget for the next year would potentially include this overspend again.
2. It encourages organisations to spend up to the maximum allowed (encourages slack) in the knowledge that if they don’t do this then they will not have as much to spend in the following year’s budget.

3. Assessing the amount of the increment can be difficult.

4. It is not appropriate in a rapidly changing business.

5. Can ignore the true (activity based) drivers of a cost leading to poor budgeting.

Activity-Based Budget

Activity-based budgeting (ABB) would need a detailed analysis of costs and cost drivers so as to determine which cost drivers and cost pools were to be used in the activity-based costing system.

However, whereas activity-based costing uses activity-based recovery rates to assign costs to cost objects, ABB begins with budgeted cost-objects and works back to the resources needed to achieve the budget.

The budgeted activity levels are determined in the same way as for conventional budgeting in that a sales budget and a production budget are drawn up.

ABB then determines the quantity of activity cost drivers (e.g. number of purchase orders, number of set-ups) needed to support the planned sales and production.

Standard cost data would be compiled that include details of the activity cost drivers required to produce a product or number of products.

The resources needed to support the budgeted quantity of activity cost drivers would then be determined (e.g. number of labour hours to process purchase orders, number of maintenance hours needed to complete set-ups).

This resource need would then be matched against the available capacity (i.e. number of purchase clerks to process purchase orders) to see whether any capacity adjustment were needed.

Advantages of ABB

1. Organisational resources are allocated more efficiently due to the detailed cost and activity information obtained by implementing an ABB system.

2. It avoids slack that is often linked to incremental budgeting due to its detailed assessment of the activities and resources needed to support planned sales and production.

3. In ABB the costs of support activities are not seen as fixed costs to be increased by annual increments, but as depending to a large extent on the planned level of activity.
4. It provides a useful basis for monitoring and controlling overhead costs, by drawing management attention to the actual costs of activities and comparing actual costs with what the activities were expected to cost.

Disadvantages of ABB

1. A considerable amount of time and effort might be needed to establish an ABB system, for example to identify the key activities and their cost drivers.

2. ABB might not be appropriate for the organisation and its activities and cost structures.

3. A budget should be prepared on the basis of responsibility centres, with identifiable budget holders made responsible for the performance of their budget centre.

   A problem with ABB could be to identify clear individual responsibilities for activities.

4. It could be argued that in the short term many overhead costs are not controllable and do not vary directly with changes in the volume of activity for the cost driver. The only cost variances to report would be fixed overhead expenditure variances for each activity.

Feed-Forward Control

Feed-forward control is defined as the ‘forecasting of differences between actual and planned outcomes and the implementation of actions before the event, to avoid such differences’.

Whereas feedback is based on a comparison of historical actual results with the budget for the period to date, feed-forward compares:

* the target or objectives for the period, and
*
* the actual results forecast.

Advantages of Feed-Forward Control

1. It informs managers of what is likely to happen unless control action is taken.
2. It encourages managers to be proactive and deal with problems before they occur.
3. Re-forecasting on a monthly or continuous basis can save time when it comes to completing a quarterly or annual budget.

Disadvantages of Feed-Forward Control

1. It may be time consuming as control reports must be produced regularly.
2. It may require a sophisticated forecasting system, which might be expensive.

Zero-Based Budgeting

Zero-based budgeting requires that activities be re-evaluated as part of the budget process so that each activity, and each level of activity, can justify its consumption of the economic resources available.

This is in contrast to incremental budgeting, where the current budget is increased to allow for expected future conditions. Zero-based budgeting prevents the carrying forward of past inefficiencies that can be a feature of incremental budgeting and focuses on activities rather than departments or programmes.

Each activity is treated as though it was being undertaken for the first time and is required to justify its inclusion in the budget in terms of the benefit expected to be derived from its adoption.

Steps in zero-based budgeting

Zero-based budgeting involves three main stages

1. Activities are identified by managers. These activities are then described in what is called a 'decision package'.

   This decision package

   a. Analyses the cost of the activity

   b. States its purpose

   c. Identifies alternative methods of achieving the same purpose

   d. Establishes performances measures for the activity

    e. Assesses the consequence of not performing the activity at all or of performing it at different levels.

    This decision package is prepared at the base level, representing the minimum level of service or support needed to achieve the organisation's objectives. Further incremental packages may then be prepared to reflect a higher level of service or support

2. Management will then rank all the packages in the order of decreasing benefits to the organisation.

    This will help management decide what to spend and where to spend it.

3. The resources are then allocated based on order of priority up to the spending level

Advantages claimed for zero-based budgeting

1. It eliminates the inefficiencies that can arise with incremental budgeting.
2. It fosters a questioning attitude towards current activities.
3. It focuses attention on the need to obtain value for money from the consumption of organisational resources.

Disadvantages claimed for zero-based budgeting

1. Departmental managers will not have the skills necessary to construct decision packages. They will need training for this and training takes time and money.
2. In a large organisation, the number of activities will be so large that the amount of paperwork generated from ZBB will be unmanageable.
3. Ranking the packages can be difficult, since many activities cannot be compared on the basis of purely quantitative measures. Qualitative factors need to be incorporated but this is difficult.
4. The process of identifying decision packages, determining their purpose, costs and benefits is massively time consuming and therefore costly.
5. Since decisions are made at budget time, managers may feel unable to react to changes that occur during the year. This could have a detrimental effect on the business if it fails to react to emerging opportunities and threats.

It could be argued that ZBB is more suitable for public sector than for private sector organisations. This is because, firstly, it is far easier to put activities into decision packages in organisations which undertake set definable activities. Local government, for example, has set activities including the provision of housing, schools and local transport.

Secondly, it is far more suited to costs that are discretionary in nature or for support activities. Such costs can be found mostly in not for profit organisations or the public sector, or in the service department of commercial operations.

Since ZBB requires all costs to be justified, it would seem inappropriate to use it for the entire budgeting process in a commercial organisation. Why take so much time and resources justifying costs that must be incurred in order to meet basic production needs?

It makes no sense to use such a long-winded process for costs where no discretion can be exercised anyway. Incremental budgeting is, by its nature, quick and easy to do and easily understood. These factors should not be ignored.

Master Budget

The master budget is a summary of all of the budgets which generally comprises a budgeted income statement, a budgeted statement of financial position and a budgeted cash flow statement.

Assuming that the level of demand is the principal budget factor, the various functional, departmental and master budgets will be drawn up in the following order.

Functional Budget

Functional budgets are prepared and consolidated to produce the master budget. These would include raw materials budget, raw material usage and purchases budgets, sales budget and production budget.

Fixed Budget

A fixed budget is one prepared in advance of the relevant budget period which is not changed or amended as the budget period progresses.

This budget represents a periodic approach to budgeting, since a new budget is prepared towards the end of the budget period for the subsequent budget period. In this way, an organisation may set a new budget on an annual basis.

A fixed budget is likely to be useful in circumstances where the organisational environment is relatively stable and can be predicted with a reasonable degree of certainty.

Flexible Budget

A flexible budget is a budget which, by recognising different cost behaviour patterns, is designed to change as volumes of output change.

Beyond Budgeting

Various commentators have identified the drawbacks of traditional budgets that they:

1. rarely focus on strategy and are often contradictory
2. are time consuming and costly to put together
3. constrain responsiveness and flexibility
4. often deter change
5. add little value, especially given the time taken to prepare them
6. focus on cost reduction rather than value creation
7. strengthen vertical command and control.

Beyond Budgeting is based on 6 principles

- front line teams to take decisions
- a high performance climate based on performance reviews, internal competition and a sense of customer ownership
- front line teams with the freedom to take decisions in line with the company's governance principles and strategic goals
- teams given responsibility for value creating systems
- teams focused on customer outcomes
- open and ethical information systems which generates more reliable information, greater transparency and more ethical reporting

Flexed Budgets

A flexed budget

is a budget prepared to show the revenues, costs and profits that should have been expected from the actual level of production and sales.

If the flexed budget is compared with the actual results for a period, variances will be much more meaningful.

The high-low method may have to be used in order to determine the fixed and variable elements of semi-variable costs.

However, please note that fixed costs remain unchanged regardless of the level of activity and should not be flexed.

How to flex a budget?

Consider this - you plan to make 10 products.

Each product should use 2Kg each.

Therefore the budgeted number of Kg is 20Kg

Actually 14 products were made and 25Kg used.

If the budget wasn't flexed you would compare 25Kg to the budgeted 20Kg and get an ADVERSE variance of 5Kg.

But this is not taking into account the fact that 4 more products were made than budgeted

So we need to flex this budget..

Actual Quantity of 14 should take 2kg each = 28kg

Actual Kg used 25kg

Therefore, the usage variance is actually 3 kg FAVOURABLE

Illustration

The budget was for 100 items at a labour cost of $200

The actual amount produced was 120 items at a labour cost of $250

Flex the budget and compare actual to budgeted

$200 / 100 x 120 = $240 (Flexed Budget)

Compare to actual = $250

$10 over budget

Information used in Budget Systems

Information

Past data may be used as a starting point for the preparation of budgets but other information from a wide variety of sources will also be used.

Each function of the organisation will be required to estimate revenue and expenditure for the budget period. For example, marketing, personnel and research and development.

The main sources of information for budgeting purposes are

1. Previous year’s actual results.
2. Other internal sources which may include manager’s knowledge.
3. Long-term requirements of individual customers, etc.
4. Estimates of costs of new products using work study techniques, technical estimates from research and development, etc.
5. Statistical techniques such as linear regression may help to forecast sales. EOQ may be used to forecast optimal inventory levels.
6. External sources of information may include suppliers' price lists, estimates of inflation and exchange rate movements, strategic analysis of the economic environment. Senior managers may incorporate assumptions concerning competitor actions based on the analysis of the market.

Negotiation of Targets

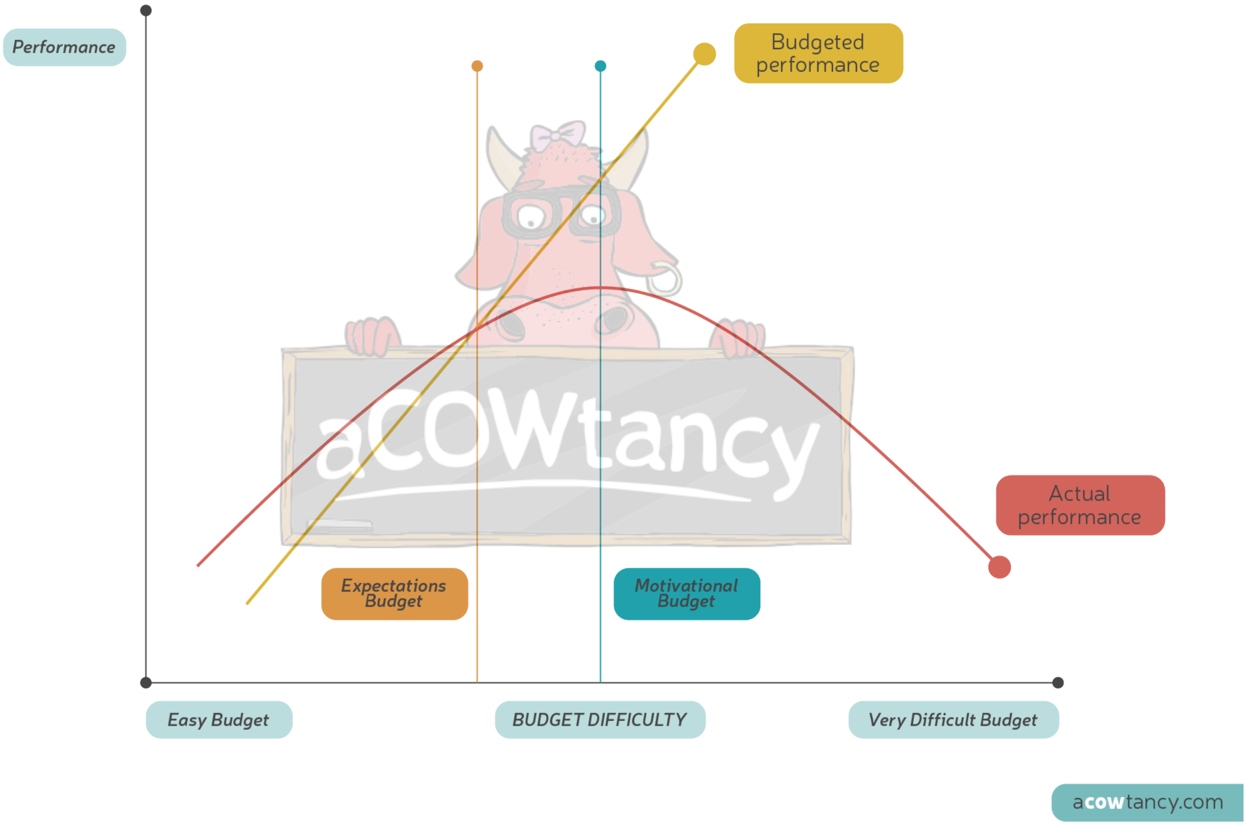
Setting the difficulty level of a budget

Targets will motivate employees if they are at the right level.

An expectations budget is a budget set at current achievable levels. Therefore, it is unlikely to motivate managers to improve.

An aspirations budget is a budget set at a level which is higher than the achievable level. Therefore, this will motivate managers to improve if it seen as achievable.

The relationship between budget difficulty and actual performance



In the public sector, the objectives of the organisation are more difficult to define in a quantifiable way than the objectives of a private company.

For e.g., a private company's objectives may be to maximise profit. This can then be set out in the budget by aiming for a % increase in sales revenue and perhaps the cutting of various costs.

On the other hand, if the public sector organisation is a hospital, then the objectives may be largely qualitative, such as ensuring that all outpatients are given an appointment within six weeks of being referred to the hospital. This is difficult to define in a quantifiable way.

Just as objectives are difficult to define quantifiably, so too are the organisation's outputs. In a private company the output can be measured in terms of sales revenue. In a hospital, on the other hand, it is difficult to define a quantifiable relationship between inputs and outputs.

What is easier to compare is the relationship between how much cash is available for a particular area and how much cash is actually needed.

Therefore, budgeting naturally focuses on inputs alone, rather than the relationship between inputs and outputs.

Finally, public sector organisations are always under pressure to show that they are offering good value for money, i.e. providing a service that is economical, efficient and effective (value for money approach).

Therefore, they must achieve the desired results with the minimum use of resources. This, in itself, makes the budgeting process more difficult.

Setting the difficulty level for a budget

Participation in setting targets

Participation in the budgeting process will improve motivation and so will improve the quality of budget decisions and the efforts of individuals to achieve their budget targets. However, this may be time consuming and may result in a wide range of targets which are seen as unfair.

There are basically two ways in which a budget can be set: from the top down (imposed budget) or from the bottom up (participatory budget).

Top down budget

This is also called an ‘authoritative’ or ‘non-participative’ budget as it is set without allowing the ultimate budget holder the opportunity to participate in the budgeting process.

These budgets will begin with upper level management establishing parameters under which the budget is to be prepared.

Lower-level personnel have very little input in setting the overall goals of the organisation as they are essentially reduced to doing the basic budget calculations consistent with directives.

Advantages of a top down budget

1. Top-down budgets can set a tone for the organisation. They signal expected sales and production activity that the organisation is supposed to reach.
2. Budgets will be in line with corporate objectives.
3. Decisions taken by experienced managers.
4. Budgetary slack reduced.

Disadvantages of a top down budget

1. Lower-level managers may view the budget as dictatorial.
2. Such budgets can sometimes provide ethical challenges, as lower-level managers may find themselves put in a position of ever-reaching to attain unrealistic targets for their units.

Bottom up budget

The budget holders have the opportunity to participate in setting their own budgets. In fact, the lowest level organisational units are asked to submit their estimates of expenditure for the next year.

Senior management, meanwhile, has made a forecast of the income it expects to receive. There maybe a negative variance between the forecast revenue and the sum of the departments’ budgets.

The variance is resolved by lengthy discussions or arbitrary decisions. This type of budget is also called **participative budget.**

Advantages of a bottom up budget

1. Improved employee morale and job satisfaction – hence increased motivation.
2. The budget is prepared by those who have the best knowledge of their own specific areas of operation – better information.
3. Increases managers’ understanding and commitment.
4. Better communication between departments.

Disadvantages of a bottom up budget

1. Generally more time consuming and expensive to develop and administer.
2. Some managers may try to "pad" their budget, giving them more room for mistakes and inefficiency - budgetary slack (bias).
3. Budgets may not be in line with corporate objectives – dysfunctional behaviour.
4. Decisions made by inexperienced managers.

Changing a Budgetary System

It has been argued that traditional budgets are too rigid and prevent fast response to changing conditions.

However, an organisation which decides to change its type of budget used, or budgetary system, will face a number of difficulties. A change in the system must be carefully planned and implemented.

Changing a budgetary system

- Resistance by employees. Employees will be familiar with the current system and may have built in slack so will not easily accept new targets. New control systems that threaten to alter existing power relationships may be thwarted by those affected.
- Loss of control. Senior management may take time to adapt to the new system and understand the implications of results.
- Training. In order for the new budget to operate effectively, everyone within the organisation will need to be fully trained. This is time-consuming and expensive.
- Costs of implementation. Any new system or process requires careful implementation which will have cost implications.
- Lack of accounting information. The organisation may not have the systems in place to obtain and analyse the necessary information.

Dealing with Uncertainty in the Environment

In the budgeting process, there may be uncertainty at various levels.

Causes of uncertainty in the budgeting process

- Customers. They may decide to buy less than forecast, or they may buy more.
- Products/services. In the modern business environment, organisations need to respond to customers' rapidly changing requirements.
- Inflation and movements in interest and exchange rates.
- Volatility in the cost of materials.
- Competitors. They may steal some of an organisation's expected customers, or some competitors' customers may change their buying allegiance.
- Employees. They may not work as hard as was hoped, or they may work harder.
- Machines. They may break down unexpectedly.
- There may be political unrest (terrorist activity), social unrest (public transport strikes) or minor or major natural disasters (storms, floods).

Rolling budgets and flexible budgets are a way of trying to reduce the element of uncertainty in the plan. There are other planning methods which try to analyse the uncertainty such as probabilistic budgeting, sensitivity analysis (what if?), scenario planning and simulation.

These methods are suitable when the degree of uncertainty is quantifiable from the start of the budget period and actual results are not expected to go outside the range of these expectations.

Syllabus D2. Quantitative techniques

Fixed and variable cost elements

Analyse semi-variable costs

There are two main methods which analyse semi-variable costs into their fixed and variable elements: -

- High/low method
- Least squares regression (this will not be directly examined in F5 from 2013 onwards)

High-low method

The main steps are

1. Review records of costs in previous periods.

    • Select the period with the highest activity level.

    • Select the period with the lowest activity level.

2. Find the variable cost per unit

    $$\frac{\text{Total cost at high activity level - total cost at low activity level}}{\text{Total units at high activity level - total units at low activity level}}$$

3. Find the fixed costs

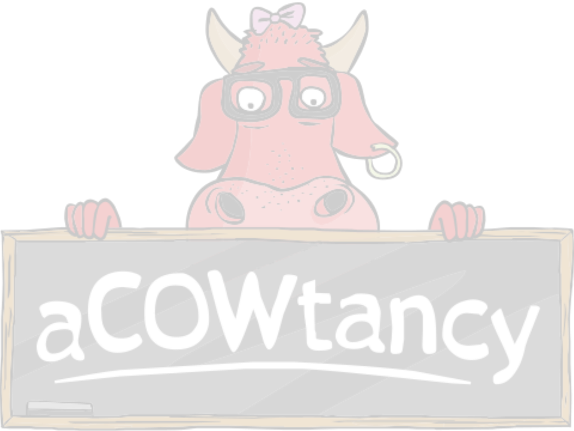
    Total cost at high activity level – (Total units at high activity level × Variable cost per unit)

Advantages of the High-Low Method

1. Easy to use
2. Easy to understand
3. Quick method

Limitations of the High-Low Method

1. It relies on historical cost data – predictions of future costs may not be reliable.
2. It assumes that the activity level is the only factor affecting costs.
3. It uses only two values to predict costs – all data falling between the highest and lowest values are ignored.
4. Bulk discounts may be available at large quantities.



A time series

is a series of figures or values recorded over time.

e.g. monthly sales over the last 3 years.

The data often conforms to a certain pattern over time.

This pattern can be extrapolated into the future and hence forecasts are possible.

Time periods may be any measure of time including days, weeks, months and quarters.

A graph of a time series is called a Histogram

A time series has 4 components:

Trend
a trend is the underlying long-term movement over time in values of data recorded

Seasonal variations or fluctuations
are short-term fluctuations in recorded values, due to different circumstances
e.g. sales of ice creams will tend to be highest in the summer months

Cycles or cyclical variations
are medium-term changes in results caused by circumstances which repeat in cycles
e.g. booms and slumps in the economy.

Residual variations
no-recurring, random variations.
These may be caused by unforseen circumstances such as a change in government, a war, technological change or a fire.
Hence these are non-repetitive and non-predictable variations.

The actual time series is:

Y = T + S + C + R

Where:
Y = the actual time series
T = the trend series
S = the seasonal component
C = the cyclical component
R = the random component

In the exam, it is unlikely that you will be expected to carry out any calculation of ‘C’. Therefore, ‘C’ will be ignored.

Time series analysis and forecasting

This is carried out in two steps:

Establishing the long-term underlying trend using moving averages or linear regression. A moving average is an average of the results of a fixed number of periods.

Establishing the regular seasonal variations (SV).

Trend and Seasonal Variations

Seasonal variations arise in the short-term.

It is very important to distinguish between trend and seasonal variation.

Seasonal variations must be taken out, to leave a figure which might be taken as indicating the trend (deseasonalised data).

One such method is called moving averages.

A moving average is an average of the results of a fixed number of periods, i.e. the mid-point of that particular period.

Please note that when the number of time periods is an even number, we must calculate a moving average of the moving average.

This is because the average would lie somewhere between two periods.

Seasonal Variations

These seasonal variations can be estimated using the additive model or the proportional (multiplicative) model.

The additive model

This is based upon the idea that each actual result is made up of two influences.

Actual = Trend + Seasonal Variation (SV) + Random Variations (R)

The SV will be expressed in absolute terms. Please note that the total of the average SV should add up to zero.

Illustration - Additive model

The trend for train passengers at Kurla station is given by the relationship:

$y = 5.2+0.24x$

y = number of passengers per annum

x = time period (2010 = 1)

What is the trend in 2019?

Solution

$y = 5.2+0.24(9) = 7.36$

The multiplicative model

Actual = Trend × SV factor x Random Variations

The SV will be expressed in proportional terms, e.g. if, in one particular period the underlying trend was known to be $10,000 and the SV in this period was given as +12%, then the actual result could be forecast as:

$10,000 × 112/100 = $11,200.

Please note that the total of the average SV should sum to 4.0, 1.0 for each quarter.

Illustration - Multiplicative model

A company uses a multiplicative time series model.

Trend = 500+30T

T1 = First quarter of 2010.

Average seasonal variation:

1st Q = -20

2nd Q = +7

3rd Q = +16

4th Q = -1

What is the sales forecast of the 3rd Q of 2012?

Solution

T = 500+((30 x 11) x 116%) = 963

Advantages of Time Series Analysis

it is useful when forecasting data which has a regular seasonal pattern as may be the case with sales of certain products

it is a rather simplistic approach

Disadvantages of Time Series Analysis

it assumes that past trends will continue indefinitely and that extrapolating data based on historic information will give valid conclusions.

In reality, the sales of products may be influenced by the actions of competitors, particularly in relation to new products becoming available on the market.

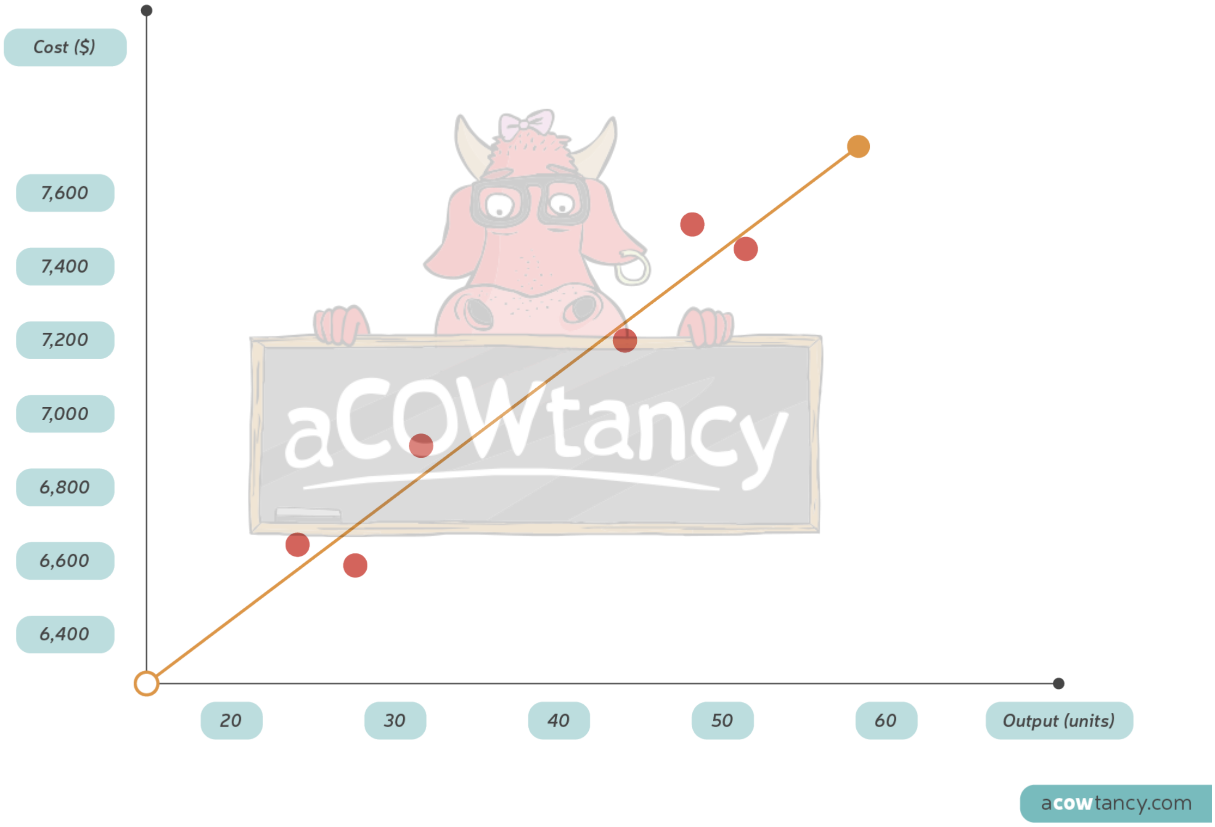
Two variables are said to be correlated if a change in the value of one variable is accompanied by a change in the value of another variable. Examples of variables which might be correlated are:

- A person's height and weight

- The distance of a journey and the time it takes to make it

One way of showing the correlation between two related variables is on a scattergraph or scatter chart, plotting a number of pairs of data on the graph.

E.g. a scattergraph showing total costs incurred at various output levels



A scattergraph can be used to make an estimate of fixed and variable costs by drawing a 'line of best fit' through the points which represents all the points plotted.

The line of best fit will be of the form

y = a + bx

where a = fixed costs

b = variable costs

The Line of Best Fit

Regression analysis can be used to establish the equation of the line of best fit.

where x is the independent variable and y is the dependent variable. This means that changing x should cause a change in y, not the other way round. When establishing a relationship between volume and costs, volume should be x, because making more units causes more costs.

When establishing a relationship between price and quantity sold, x should be price, because charging less will cause more units to be sold. N is the number of pairs of readings.

These formulae are given in the exam. Remember always start working ‘b’, then move to ‘a’.

$$a = \frac{\sum y}{n} - \frac{b\sum x}{n}$$

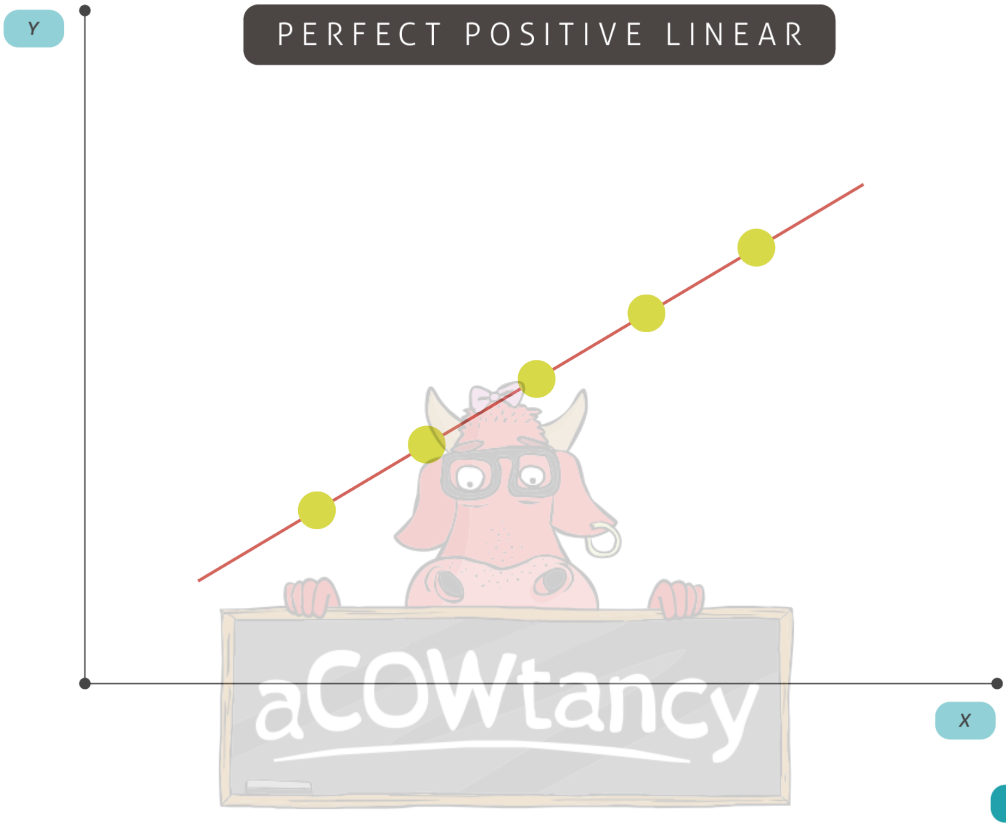
$$b = \frac{n\sum xy - \sum x\sum y}{n\sum x^2 - (\sum x)^2}$$

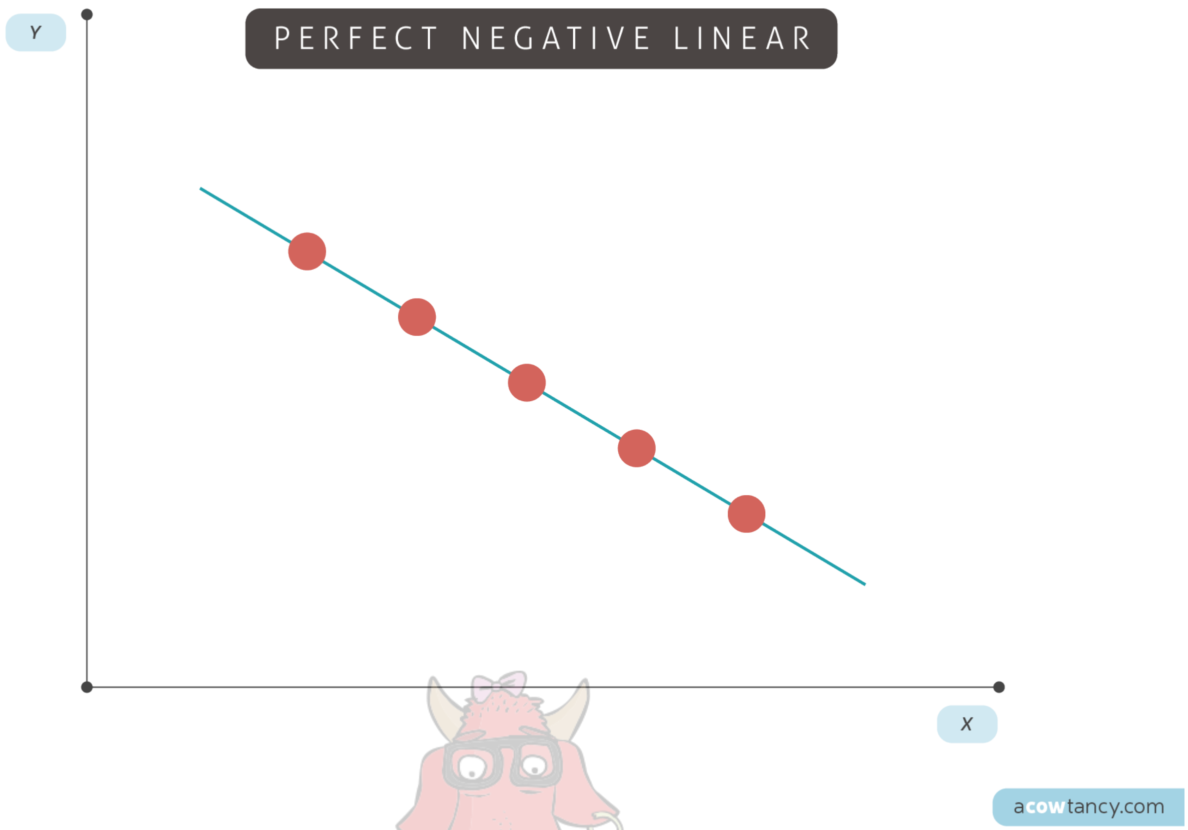
Correlation

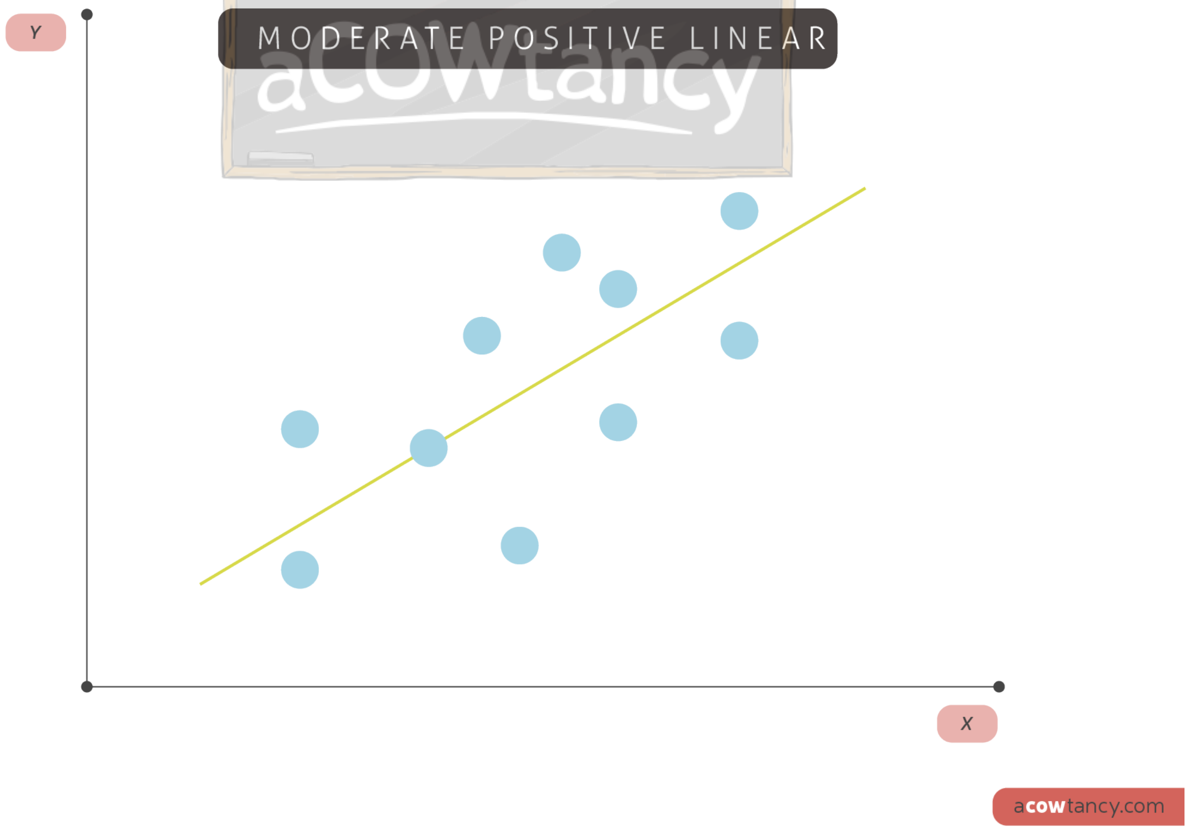
Correlation measures the strength of the relationship between two variables.

One way of measuring ‘how correlated’ two variables are, is by drawing the ‘line of best fit’ on a scattergraph.

Another way of measuring ‘how correlated’ two variables are, is to calculate a correlation coefficient, r.




PERFECT NEGATIVE LINEAR
Y
X
acowtancy.com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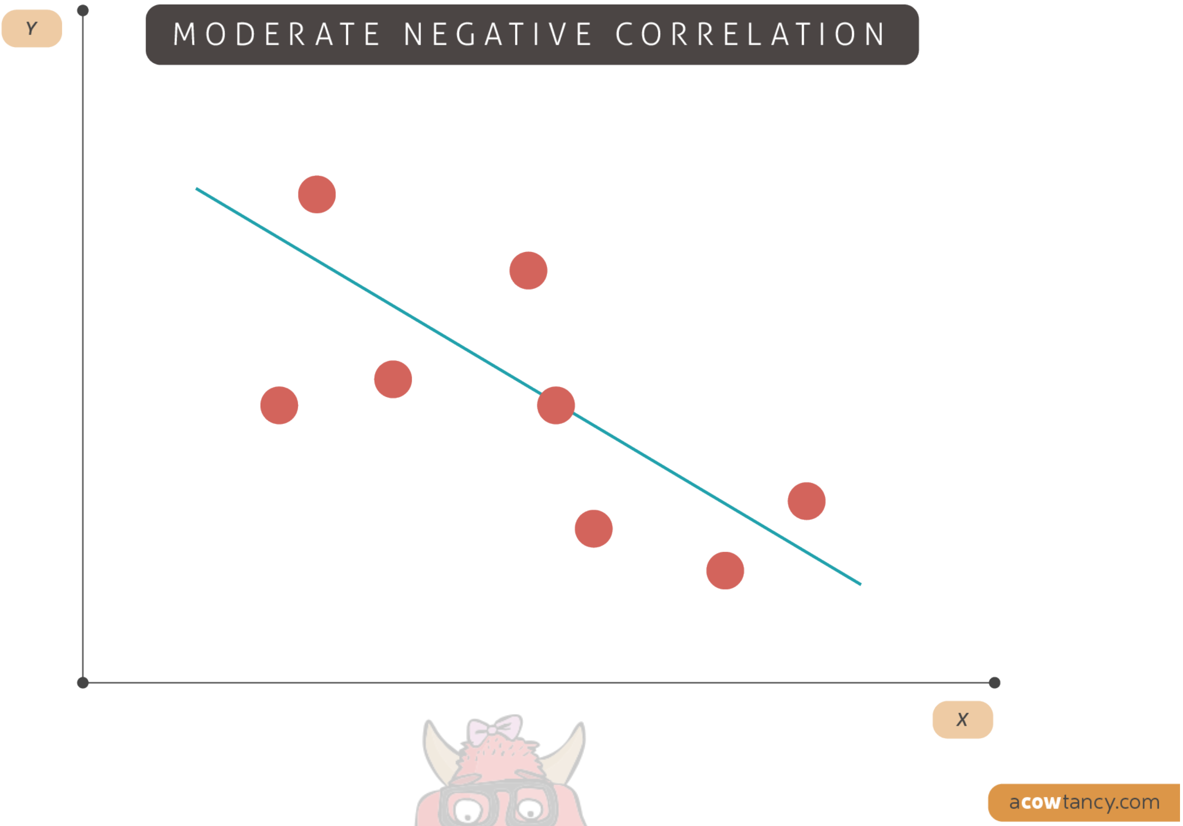
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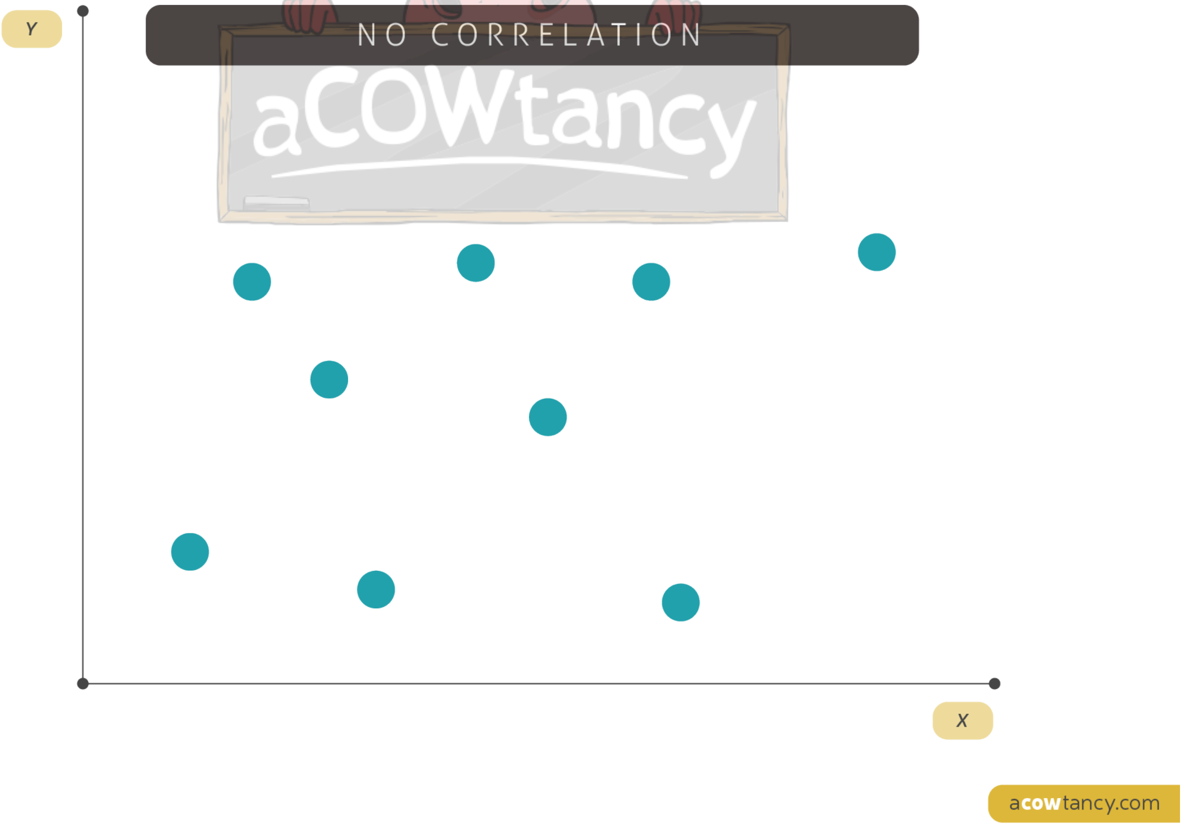

NO CORRELATION
Y
X
acowtancy.com

The correlation coefficient (r)

The correlation coefficient measures the strength of a linear relationship between two variables. It can only take on values between -1 and +1.

r = +1 indicates perfect positive correlation (all points fit on the regression line) and as one variable increases, so does the other

r = 0 indicates no correlation

r = -1 indicates perfect negative correlation (all points fit on the regression line) and as one variable increases, the other decreases

The correlation coefficient is calculated as follows: -

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left(n\sum x^2 - (\sum x)^2\right)\left(n\sum y^2 - (\sum y)^2\right)}}$$

Coefficient of determination (r2)

The coefficient of determination is the square of the correlation coefficient. It measures how much of the variation in the dependent variable is ‘explained’ by the variation of the independent variable.

For example, if r = 0.97, r2 = 0.94 or 94%.

94% of the variation in the dependent variable(y) is due to variations in the independent variable (x). 6% of the variation is due to random fluctuations. Therefore, there is high correlation between the two variables.

Learning effect and Learning Curve

The Learning Curve Theory

Learning Curve Theory is concerned with the idea that when a new job, process or activity commences for the first time, it is likely that the workforce involved will not achieve maximum efficiency immediately.

Repetition of the task is likely to make the people more confident and knowledgeable and will eventually result in a more efficient and rapid operation.

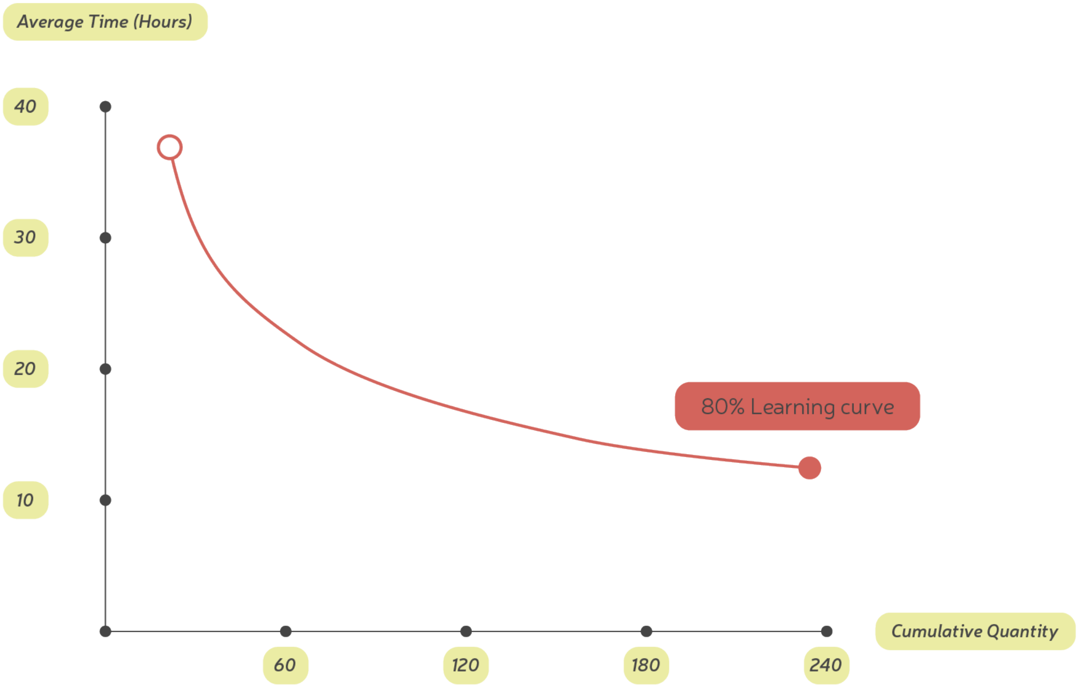
Eventually the learning process will stop after continually repeating the job (steady state). As a consequence the time to complete a task will initially decline and then stabilise once efficient working is achieved.

The cumulative average time per unit is assumed to decrease by a constant percentage every time that output doubles.

Cumulative average time refers to the average time per unit for all units produced so far, from and including the first one made.

The following is an example of an 80% learning curve:

The cumulative average time required per unit of output is reduced to 80% of the previous cumulative average time when output is doubled.



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The learning curve effect can be calculated by:

1. reducing cumulative average time by the learning rate each time output doubles in a table:

2. using the formula:

y = axb

where

y = cumulative average time (or average cost) per unit or per batch to produce x units

a = time (or cost) taken for the first unit or batch

b = log r/log 2 (r = index of learning, expressed as a decimal)

x = cumulative output in units or in batches

Application of the Learning Curve Theory

1. the activity is labour intensive (rather than highly mechanised)
2. a repetitive process for each unit
3. low turnover of labour
4. early stages of production
5. no prolonged breaks in production

Cessation of the Learning Curve Theory – The Steady State

The learning effect will only apply for a certain range of production. Once the steady state is reached, the direct labour hours will not reduce any further and this will become the basis on which the budget is produced.

The steady state will occur when: -

- machine efficiency restricts further improvements
- machines have reached the limits of safe running speeds
- there is a limit to human dexterity
- some processes cannot be speeded up any more (for e.g. a chemical reaction)
- new, inexperienced staff will replace practiced ones from time to time, slowing things down again.

Reservations with Learning Curve

Consequences of the learning curve theory

1. A standard costing system would need to set standard labour times after the learning curve had reached a plateau.

2. A budget will need to incorporate a learning cost factor until the plateau is reached.

3. A budgetary control system incorporating labour variances will have to make allowances for the anticipated time changes.

4. Identification of the learning curve will permit the company to better plan its marketing, work scheduling, recruitment and material acquisition activities.

5. The decline in labour costs will have to be considered when estimating the overhead apportionment rate.

6. As the employees gain experience they are more likely to reduce material wastage.

The learning curve theory limitations

1. The stable conditions necessary for the learning curve to take place may not be present – unplanned changes in production techniques or labour turnover will cause problems and affect the learning rate.

2. The employees need to be motivated, agree to the plan and keep to the learning schedule – these assumptions may not hold.

3. Accurate and appropriate learning curve data may be difficult to estimate.

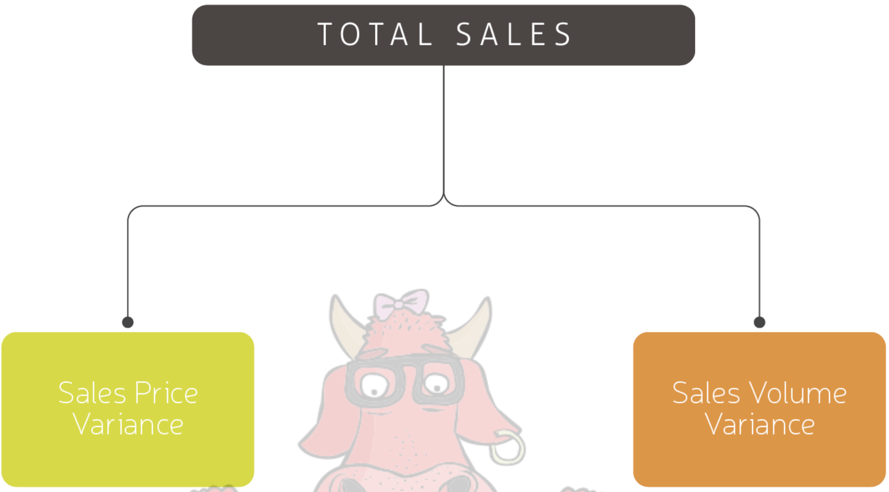
4. Inaccuracy in estimating the initial labour requirement for the first unit.

5. Inaccuracy in estimating the output required before reaching a ‘steady state’ time rate.

6. It assumes a constant rate learning factor.

Basic Variance Analysis

Sales price and volume variance



The sales price variance shows the effect on profit of selling at a different price from that expected.

sales price variance =	actual units should have sold	$x
	actual units did sell	$x
		----
	sales price variance	$x (f/a)
		----
sales volume variance =	budgeted sales volume	x units
(absorption costing)	actual sales volume	x units
		--------
	sales volume variance in units	**x units (f/a)**
	x standard profit per unit	$x
		----------
	sales volume variance in $	**$x (f/a)**
		----------
sales volume variance =	budgeted sales volume	x units
(marginal costing)	actual sales volume	x units
		------------
	sales volume variance in units	**x units (f/a)**
	x standard contribution per unit	$x
		------------
	sales volume variance in$	**$x (f/a)**

The **sale price variance** is a measure of the effect on expected profit of a different selling price to standard selling price. It is calculated as the difference between what the sales revenue should have been for the actual quantity sold, and what it was.

The **sales volume profit variance** is the difference between the actual units sold and the budgeted (planned) quantity, valued at the standard profit (under absorption costing) or at the standard contribution (under marginal costing) per unit.

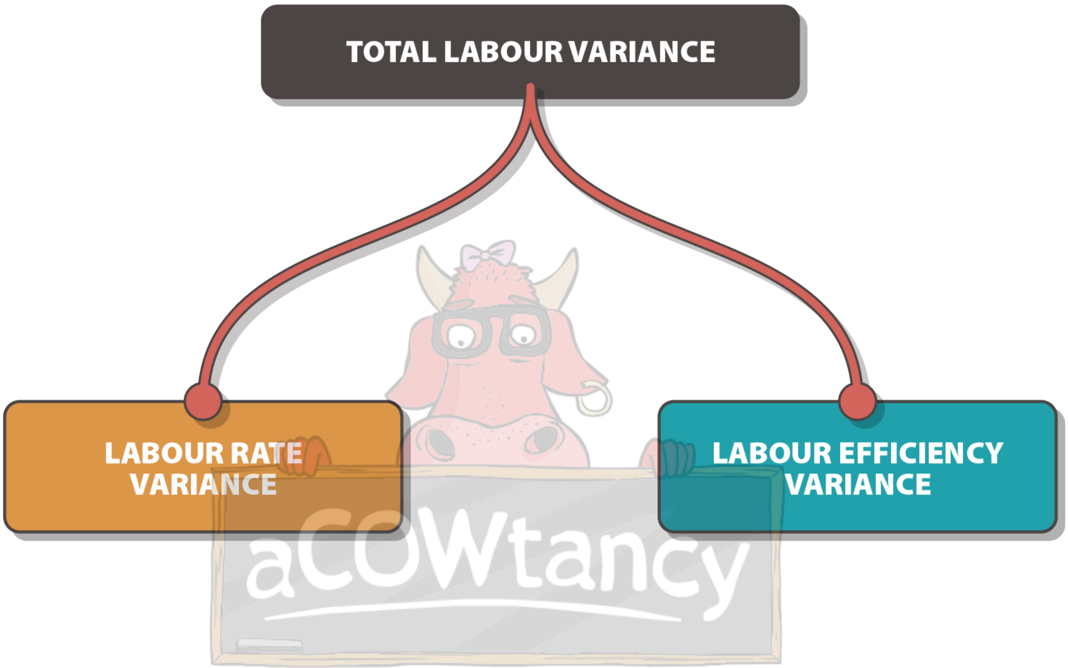
In other words, it measures the increase or decrease in standard profit as a result of the sales volume being higher or lower than budgeted (planned).

Possible causes of sales variances

- unplanned price increases
- unplanned price reduction to attract additional business
- unexpected fall in demand due to recession
- increased demand due to reduced price
- failure to satisfy demand due to production difficulties

Labour total, rate and efficiency variance

The total labour variance can be subdivided between labour rate variance and labour efficiency variance.



direct labour total variance =	**actual units should have cost**	**$x**
	actual units did cost	**$x**
		-------
	direct labour total variance	$x (f/a)
		-------

direct labour rate variance =	**actual hrs should have cost**	**$x**
	actual hrs did cost	**$x**
		-------
	direct labour rate variance	$x (f/a)
		-------

direct labour efficiency variance =	**actual units should have taken**	**x hrs**
	actual units did take	**x hrs**
		---------
	efficiency variance in hrs	x hrs (f/a)
	x standard rate per hr	**$x**
		---------
	efficiency variance in $	$x (f/a)

The direct labour total variance is the difference between what the output should have cost and what it did cost, in terms of labour.

The direct labour rate variance is the difference between the standard cost and the actual cost for the actual number of hours paid for.

In other words, it is the difference between what the labour did cost and what it should have cost.

The direct labour efficiency variance is the difference between the hours that should have been worked for the number of units actually produced, and the actual number of hours worked, valued at the standard rate per hour.

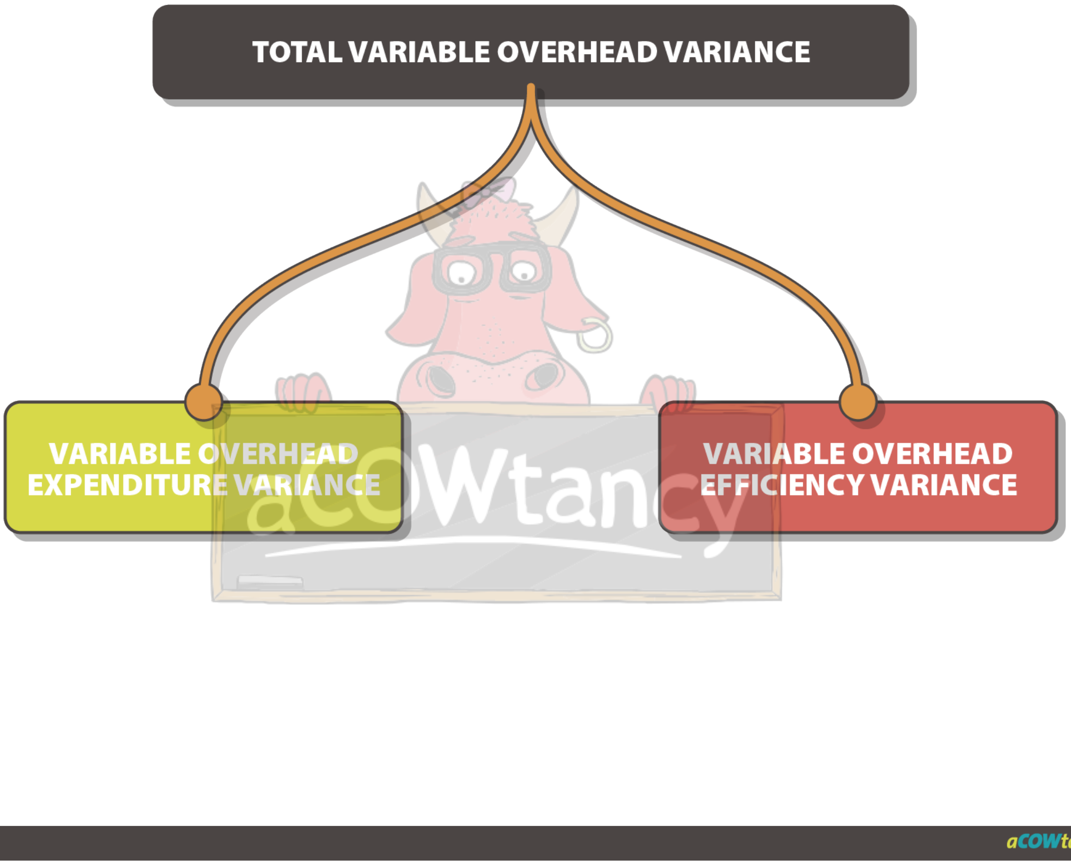
In other words, it is the difference between how many hours should have been worked and how many hours were worked, valued at the standard rate per hour.

labour rate	use of apprentices or other workers at a rate of pay lower than standard	wage rate increase use of higher grade labour
idle time	the idle time variance is always adverse	machine breakdown non-availability of material illness or injury to worker lost time in excess of standard
labour efficiency	output produced more quickly than expected because of work motivation better quality of equipment or materials, or better methods. errors in allocating time to jobs	lost time in excess of standard allowed. output lower than standard set because of deliberate restrictions, lack of training or sub-standard material used. errors in allocating time to jobs

Variable overhead total, expenditure and efficiency variance

Variable Overhead Variances

The **variable production overhead total variance** can be subdivided into the variable production overhead expenditure variance and the variable production overhead efficiency variance (based on actual hours).


TOTAL VARIABLE OVERHEAD VARIANCE
VARIABLE OVERHEAD EXPENDITURE VARIANCE
VARIABLE OVERHEAD EFFICIENCY VARIANCE
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variable overhead total variance =	**actual units should have cost**	**$x**
	actual units did cot	**$x**
		-------
	var overhead total variance	$x (f/a)
		-------

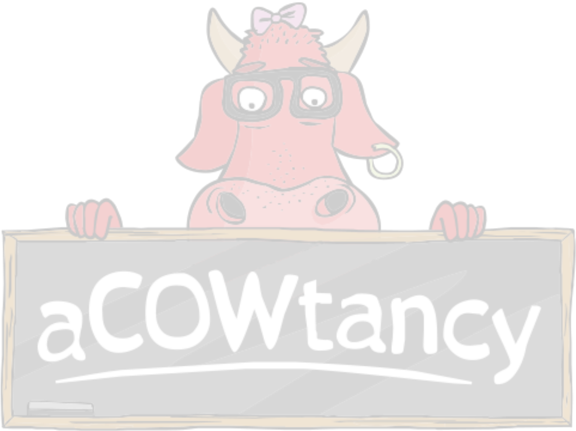
variable overhead expenditure variance =	**actual hrs should cost**	**$x**
	actual hrs did cost	**$x**
		-------
	var overhead exp variance	$x (f/a)
		-------

variable overhead efficiency variance =	**actual units shd have taken**	**x hrs**
	actual units did take	**x hrs**
		---------
	efficiency variances in hrs	x hrs (f/a)
	x standard rate per hr	**$x**
		---------
	efficiency variance in $	$x (f/a)

The **variable production overhead expenditure variance** is the difference between the amount of variable production overhead that should have been incurred in the actual hours actively worked, and the actual amount of variable production overhead incurred.

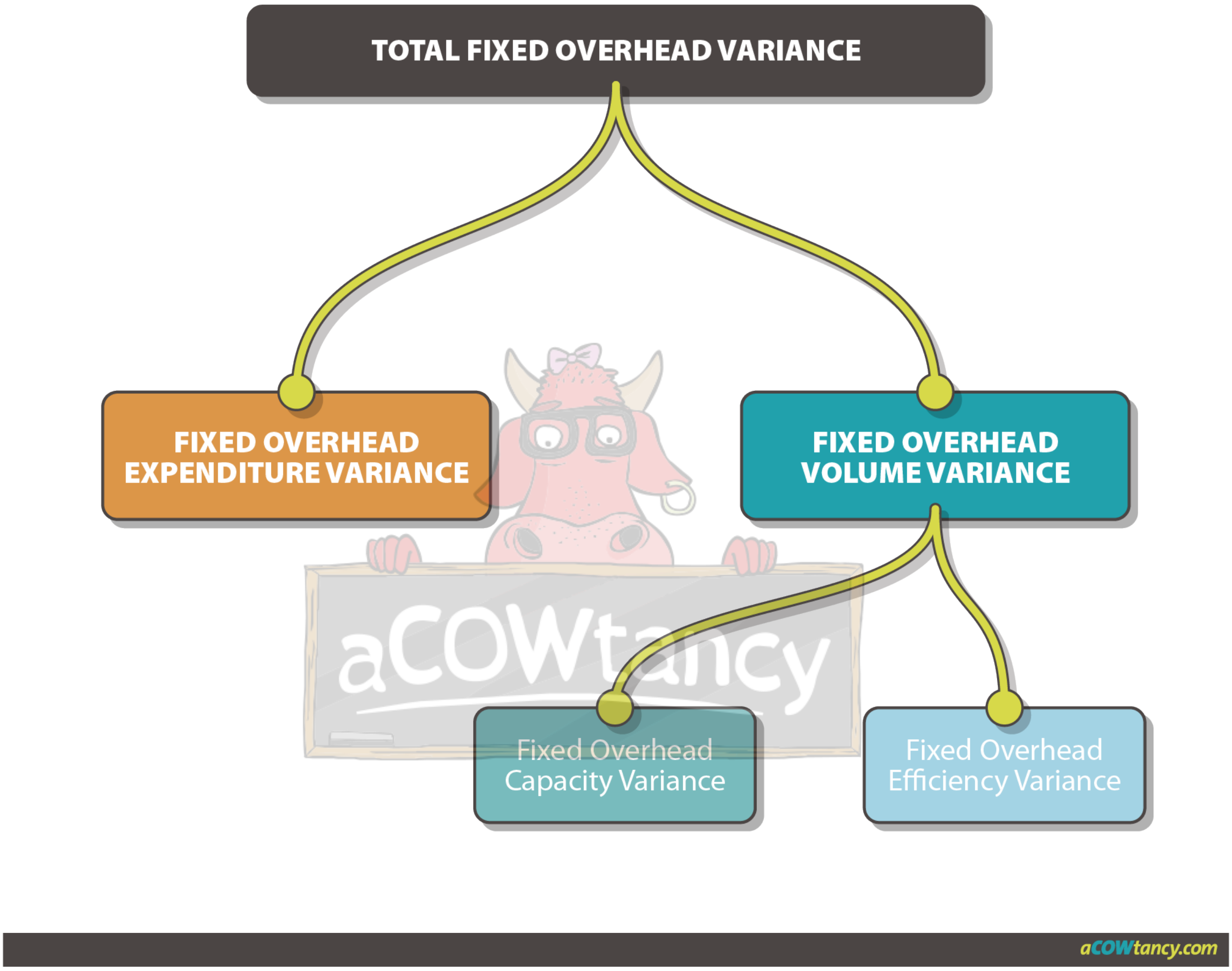
The **variable production overhead efficiency variance** is exactly the same in hours as the direct labour efficiency variance, but priced at the variable production overhead rate per hour.

variance	favourable	adverse
variable overhead expenditure	savings in costs incurred more economical use of overheads	increase in cost of overheads used excessive use of overheads change in type of overheads
variable overhead efficiency	labour force working more efficiently (favourable labour efficiency) better supervision or staff training	labour force working less efficiently (adverse labour efficiency) lack of supervision



Fixed overhead total, expenditure, volume, capacity and efficiency variance

The fixed production overhead total variance can be subdivided as follows:



TOTAL FIXED OVERHEAD VARIANCE
FIXED OVERHEAD EXPENDITURE VARIANCE
FIXED OVERHEAD VOLUME VARIANCE
Fixed Overhead Capacity Variance
Fixed Overhead Efficiency Variance
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fixed overhead total variance =	**overhead incurred**	**$x**
	overhead absorbed	**$x**
		-------
	fix overhead total variance	$x (f/a)

fixed overhead expenditure variance =	**budgeted overhead expenditure**	**$x**
	actual overhead expenditure	**$x**
		-------
	fix overhead expenditure variance	$x (f/a)
		-------

fixed overhead volume variance =	**actual units produced**	**x units**
	budgeted units produced	**x units**
		---------
	volume variance in units	x units (f/a)
	x standard rate per unit	**$x**
		---------
	volume variance in $	$x (f/a)

The **volume efficiency variance** is calculated in the same way as the labour efficiency variance.

fixed overhead vol efficiency variance =	**actual units shd have taken**	**x hrs**
	actual units did take	**x hrs**
		-------
	vol efficiency variance in hrs	x hrs (f/a)
	x standard oar rate per hr	**$x**
		----------
	vol efficiency variance in $	$x (f/a)

The **volume capacity variance** is the difference between the budgeted hours of work and the actual active hours of work (excluding any idle time).

fixed overhead vol capacity variance =	**budgeted hours of work**	**x hrs**
	actual hours of work	**x hrs**
		-------
	vol capacity variance in hrs	x hrs (f/a)
	x standard oar rate per hr	**$x**
		----------
	vol capacity variance in $	$x (f/a)

Fixed overhead total variance is the difference between fixed overhead incurred and fixed overhead absorbed. In other words, it is the under– or over-absorbed fixed overhead.

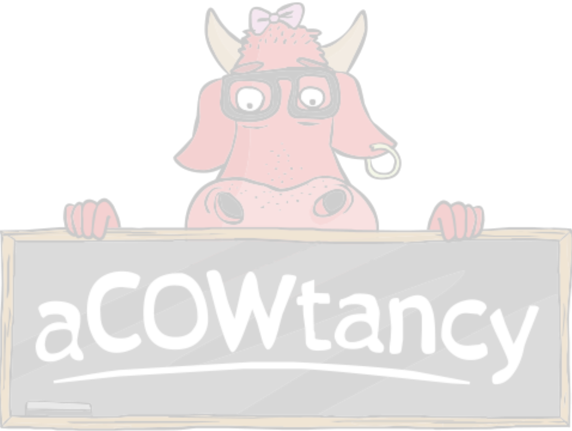
Fixed overhead expenditure variance is the difference between the budgeted fixed overhead expenditure and actual fixed overhead expenditure.

Fixed overhead volume variance is the difference between actual and budgeted (planned) volume multiplied by the standard absorption rate per unit.

Fixed overhead efficiency variance is the difference between the number of hours that actual production should have taken, and the number of hours actually taken (that is, worked) multiplied by the standard absorption rate per hour.

Fixed overhead capacity variance is the difference between budgeted (planned) hours of work and the actual hours worked, multiplied by the standard absorption rate per hour.

variance	favourable	adverse
fixed overheadexpenditure	savings in costs incurred changes in prices relating to fixed overhead expenditure	increase in cost of services used excessive use of services change in type of services used
fixed overhead volume efficiency	labour force working more efficiently	labour force working less efficiently lost production through strike
fixed overhead volume capacity	labour force working overtime	machine breakdown, strikes, labour shortage



Investigating variances

When should variances be investigated?

When deciding which variances to investigate, the following factors should be considered:

1. Reliability and accuracy of the figures.

   Mistakes in calculating budget figures, or in recording actual costs and revenues, could lead to a variance being reported where no problem actually exists (the process is actually ‘in control’).

2. Materiality.

   The size of the variance may indicate the scale of the problem and the potential benefits arising from its correction.

3. Possible interdependencies of variances.

   Sometimes a variance in one area is related to a variance in another.

   For example, a favourable raw material price variance resulting from the purchase of a lower grade of material, may cause an adverse labour efficiency variance because the lower grade material is harder to work with.

   These two variances would need to be considered jointly before making an investigation decision.

4. The inherent variability of the cost or revenue. Some costs, by nature, are quite volatile (oil prices, for example) and variances would therefore not be surprising. Other costs, such as labour rates, are far more stable and even a small variance may indicate a problem.

5. Adverse or favourable?

   Adverse variances tend to attract most attention as they indicate problems. However, there is an argument for the investigation of favourable variances so that a business can learn from its successes.

6. Trends in variances.

   One adverse variance may be caused by a random event.

   A series of adverse variances usually indicates that a process is out of control.

7. Controllability/probability of correction.

   If a cost or revenue is outside the manager’s control (such as the world market price of a raw material) then there is little point in investigating its cause.

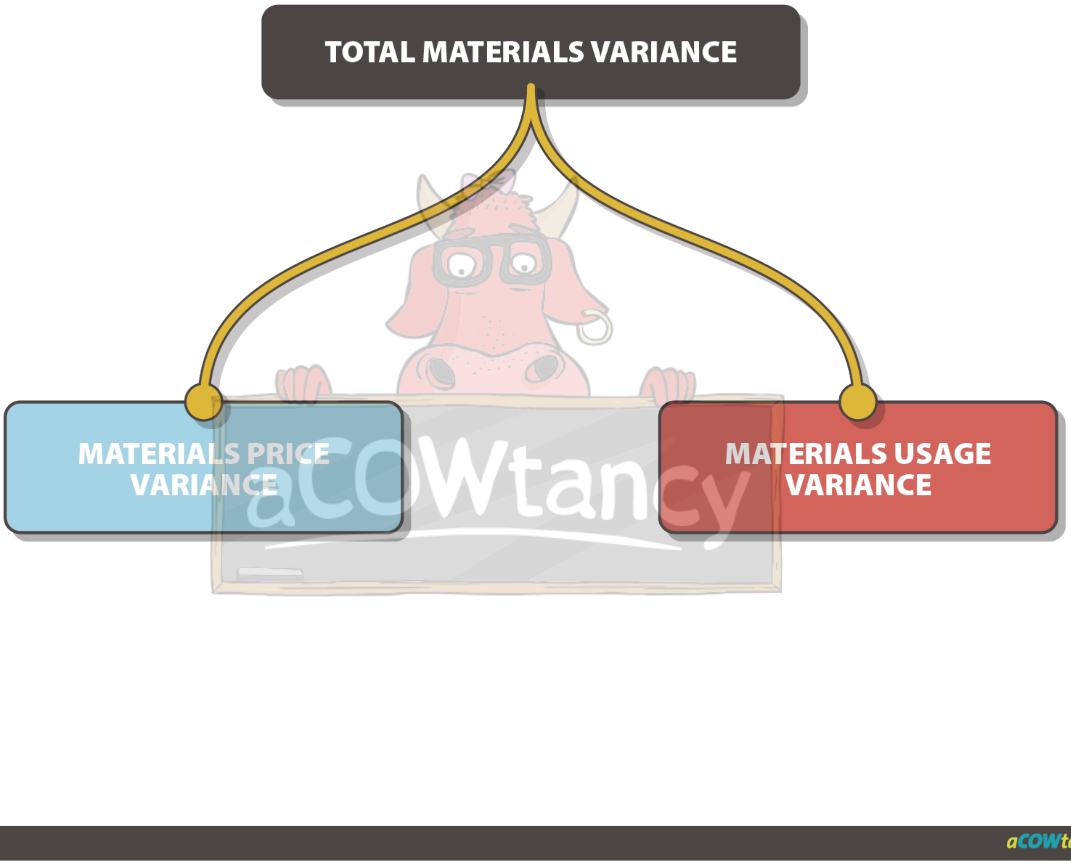
8. Costs and benefits of correction.

   If the cost of correcting the problem is likely to be higher than the benefit, then there is little point in investigating further.

Materials total, price and usage variances

Materials total, price and usage variances

The direct material total variance can be subdivided into the direct material price variance and the direct material usage variance.



direct material total variance =	actual units should have cost	$x
	actual units did cost	$x
		-------
	direct material total variance	$x (f/a)
		-------

direct material price variance =	actual kgs should have cost	$x
	actual kgs did cost	$x
		-------
	direct material price variance	$x (f/a)
		-------

direct material usage variance =	actual units should have used	x kgs
	actual units did use	x kgs
		---------
	usage variance in kgs	x kgs (f/a)
	x standard cost per kg	$x
		---------
	usage variance in $	$x (f/a)

The direct material total variance

is the difference between what the output actually cost and what it should have cost, in terms of material.

The direct material price variance

calculates the difference between the standard cost and the actual cost for the actual quantity of material used or purchased.

In other words, it is the difference between what the material did cost and what it should have cost.

The direct material usage variance

is the difference between the standard quantity of materials that should have been used for the number of units actually produced, and the actual quantity of materials used, valued at the standard cost per unit of material.

In other words, it is the difference between how much material should have been used and how much material was used, valued at standard cost.

variance	favourable	adverse
Material price	unforeseen discounts received more care taken in purchasing change in material standard	price increase careless purchasing change in material standard
Material usage	material used of higher quality than standard more effective use made of material errors in allocating material to jobs	defective material excessive waste theft stricter quality control errors in allocating material to jobs

Syllabus D3. Standard costing

Standard Costs

Standard Cost

A standard cost is a predetermined estimated unit cost of a product or service.

Therefore, a standard cost represents a target cost.

Standard costing has a variety of uses

- It is useful for planning, control and motivation.
- It is used to value inventories and cost production for cost accounting purposes.
- It acts as a control device by establishing standards (planned costs), highlighting activities that are not conforming to plan and thus alerting management to areas which may be out of control and in need of corrective action.

Methods used to derive Standard costs

Cost Card

A standard cost is based on technical specifications for the materials, labour time and other resources required and the prices and rates for the materials and labour.

A standard cost card shows full details of the standard cost of each product.

Standard cost card - product A		
	$	
Direct material x kgs / ltrs	x	
	x	
	x	
	--	
Standard direct cost (prime cost)	**x**	
Variable production overheads	x	
	--	
Standard variable cost of production	**x**	(marginal costing)
Fixed production overhead	x	
	--	
Standard full production cost	**x**	(absorption costing)
Administration & marketing overhead	x	
	--	
Standard cost of sale	x	
Standard profit	x	
	--	
Standard sales price	**x**	
	--	

Four main types of cost standards

1. ***Basic standards***

   – these are long-term standards which remain unchanged over a period of years. They are used to show trends over time.

   Basic standards may become increasingly easy to achieve as time passes and hence, being undemanding, may have a negative impact on motivation.

2. ***Ideal standards***

   – these standards are based upon perfect operating conditions.

   Therefore, they include no wastage, no scrap, no breakdowns, no stoppages, no idle time.

   Since perfect operating conditions are unlikely to occur for any significant period, ideal standards will be very demanding and are unlikely to be accepted as targets by the staff involved as they are unlikely to be achieved.

   Using ideal standards as targets is therefore likely to have a negative effect on employee motivation.

3. ***Attainable standards***

   – these standards are based upon efficient but not perfect operating conditions. These standards include allowances for the fatigue, machine breakdown and normal material losses.

   Attainable standards motivate performance as they can be achieved can be used for product costing, cost control, inventory valuation, estimating and as a basis for budgeting.

4. ***Current standards***

   – these standards are based on current level of efficiency and incorporate current levels of wastage, inefficiency and machine breakdown.

   They do not provide any incentive to improve on the current level of performance. Their impact on motivation will be a neutral one.

   Current standards are useful during periods of high inflation.

Flexing Budgets

Budgets

A **flexible budget** is a budget which, by recognising different cost behaviour patterns, is designed to change as volume of activity changes.

A **flexed budget** is a budget prepared to show the revenues, costs and profits that should have been expected from the actual level of production and sales.

Budgetary control involves drawing up budgets for the areas of responsibility for individual managers and of regularly comparing actual results against expected results.

The differences between actual results and expected results are called variances and these are used to provide a guideline for control action by individual managers.

Principle of Controllability

Responsibility accounting

is a system that segregates revenue and costs into areas of personal responsibility

Why?

To monitor and assess the performance of each part of an organisation.

Controllability

The principle of **controllability** is that managers of responsibility centres should only be held accountable for costs over which they have some influence.

They may become demotivated if they are made responsible for non-controllable costs.

- Budgetary control is based around a system of budget centres.
- Each budget centre will have its own budget and a manager will be responsible for managing the budget centre and ensuring that the budget is met.

Controllable costs

Managers CAN control them.

Most variable costs within a department are thought to be controllable in the short term because managers can influence the efficiency with which resources are used.

Non-controllable costs

Managers CAN'T control them.

Some costs are non-controllable, such as increases in expenditure items due to inflation.

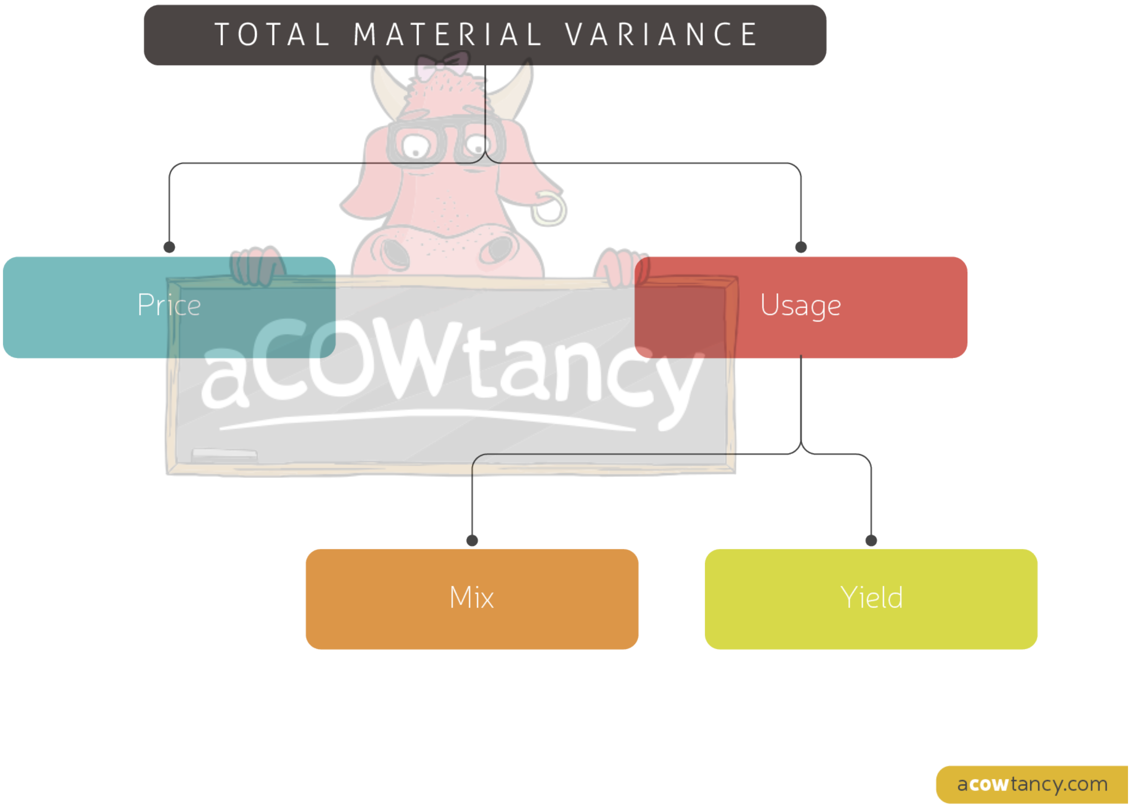
Syllabus D4. Material mix and yield variances

Material Mix and Yield Variances

Material Variances

The total material variance is divided into the price and usage variances.

Moving a step forward, the usage variance is divided into mix and yield variances.



Material Mix Variance

The mix variance is calculated as the **difference between the actual total quantity used in the standard mix and the actual quantities used in the actual mix, valued at standard costs.**

The standard mix shows the proportion of a material that we expect to use in a given mix.

The mix variance identifies the amount by which the actual proportion differs from the standard mix.

A **favourable material mix variance** would suggest that a higher proportion of a cheaper material is being used, hence reducing the overall average cost per unit.

An **adverse material mix variance** indicates that more of the expensive material was used in the actual input than indicated by the standard mix.

Material Yield Variance

The yield variance is calculated as the difference between the standard input for what was actual output, and the actual total quantity input (in the standard mix), valued at standard costs.

The yield variance identifies if the inputs (in total) are greater or less than expected for a given output.

A **favourable material yield variance** indicates that more output was produced from the quantity of material used than expected by the standard.

The increase in yield is likely to be the result of employing more skilled labour, or introducing more efficient working practices.

An **adverse material yield variance** suggests that less output has been achieved for a given input, i.e. the total input in volume is more than expected for the output achieved.

When to calculate the mix and yield variance

It is only appropriate to calculate and interpret material mix and yield variances if quantities in the standard mix can be varied.

It has also been argued that calculating yield variances for each material is not useful, as yield is related to output overall rather than to particular materials in the input mix.

A further complication is that mix variances for individual materials are inter-related and so an explanation of the increased use of one material cannot be separated from an explanation of the decreased use of another.

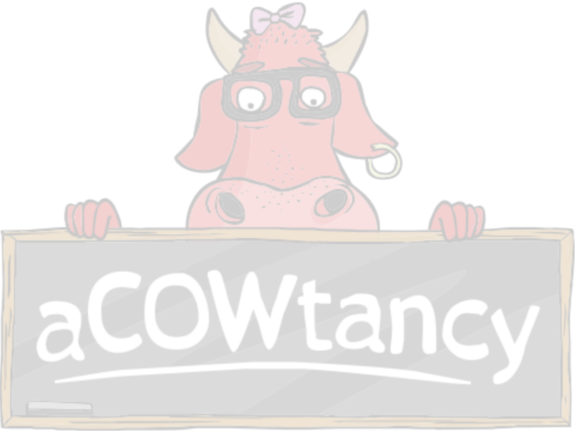
Changing Material Mix

Change in Mix

The materials mix variance indicates the cost of a change in the mix of materials and the yield variance indicates the productivity of the manufacturing process. A change in the mix can have wider implications.

For example, rising raw material prices may cause pressure to change the mix of materials. Even if the yield is not affected by the change in the mix, the quality of the final product may change. This can have an adverse effect on sales if customers do not accept the change in quality.

The production manager’s performance may be measured by mix and yield variances but these performance measures may fail to indicate problems with falling quality and the impact on other areas of the business. Quality targets may also be needed.



Controlling Production Processes

Control purpose

In a modern manufacturing environment with an emphasis on quality management, mix and yield variances for control purposes may not be possible or may be inadequate.

Other performance measures and targets

- Rates of wastage
- Average cost of input calculations
- Percentage of deliveries on time
- Customer satisfaction ratings
- Yield percentage calculations or output to input conversion rates

Syllabus D5. Sales mix and quantity variances

Sales Mix and Quantity Variances

Sales Variances

Where a company sells several different products that have different profit margins, the sales volume variance can be divided into a sales quantity (sometimes called a sales yield variance) and sales mix variance.

The **quantity variance** measures the effect of changes in physical volume on total profits. The **mix variance** measures the impact arising from the actual sales mix being different from the budgeted sales mix.

The variances can be measured either in terms of contribution margins or profit margins.

Syllabus D6. Planning and operational variances

Planning and Operational Variances for sales

Planning and operational Variances

We can divide the total variance into:

1. **Planning variances** (or revision variances)

   Are variances which have arisen because of inaccurate planning or faulty standards

   A planning variance compares an original standard with a revised standard that should or would have been used if planners had known in advance what was going to happen.

   A planning variance is deemed not controllable by management.

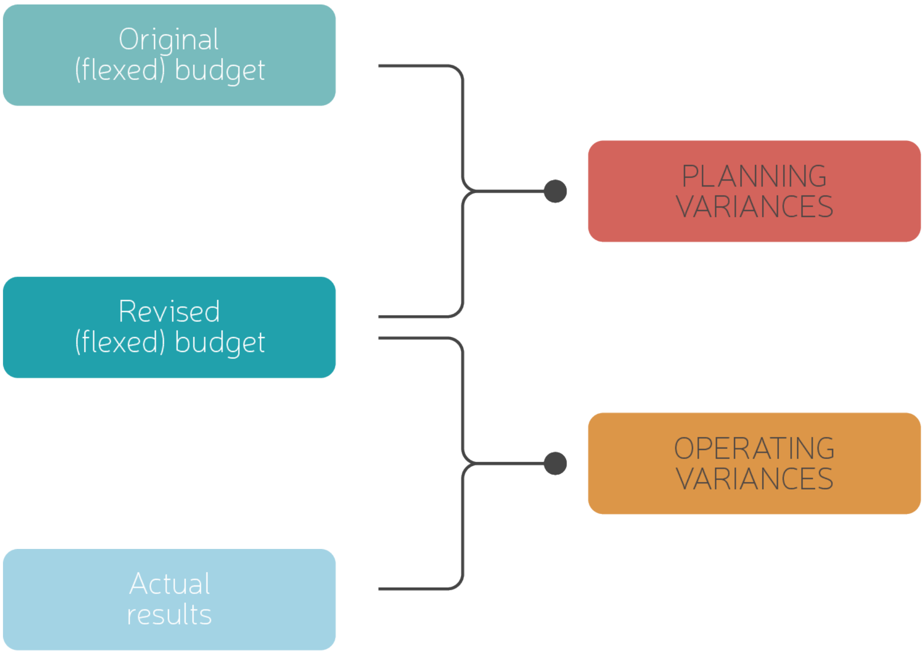
   i.e. management may not be held responsible.

2. **Operational variances** (or operating variance)

   Are variances which have been caused by adverse or favourable operational performance, compared with a standard which has been revised in hindsight.

   An operational variance compares an actual result with the revised standard.
   It is deemed controllable by management.

   Hence, management is held responsible for operational variances.



Planning and operational variances for sales

For sales, two variances have to be calculated

Planning – market volume/size variance

Operational – market share variance

Planning and Operational Variances for material & labour

Planning and operational variances for materials and labour

For materials and labour, planning and operational variances can be calculated by comparing original and revised budgets (planning) and revised budgets with actual results (operational).

A material price planning variance is really useful to provide feedback on just how skilled managers are in estimating future prices.

The operational variance is more meaningful as it measures the purchasing department's efficiency given the market conditions that prevailed at that time. It ignores factors which cannot be controlled by purchasing department.

Illustration 1

Budgeted Material price per kg is $5

Budgeted Material per unit = 4kg

Actual Output is 10,000 units

The standard price for the raw material purchased should have been $6 per kg.

The material price planning variance is:

- **Solution**

  Standard price $6 - Budgeted price $5 = $1

  $1 x 4kg x 10,000 units = $40,000 (A) - adverse

Advantages and limitations of Planning and Operational Variances

Advantages of a system of planning and operational variances

1. The analysis highlights those variances which are controllable and those which are non-controllable.

2. Managers' acceptance of the use of variances for performance measurement, and their motivation, is likely to increase if they know they will not be held responsible for poor planning and faulty standard setting.

3. The planning and standard-setting processes should improve; standards should be more accurate, relevant and appropriate.

4. Operational variances will provide a 'fairer' reflection of actual performance.

Limitations of planning and operational variances

The limitations of planning and operational variances, which must be overcome if they are to be applied in practice.

1. What should a realistic / achievable standard be? This may be difficult to decide.

2. It may become too easy to justify all the variances as being due to bad planning, so no operational variances will be highlighted.

3. Revising and analysing variances into planning and operational will take time and can be costly.

4. Do managers use correctly this meaningful info? How can it improve their performance? Does it lead to better decision-making?

Revise an original budget

Revision

A budget forms the basis of many performance management systems.

Once set, it can be compared to the actual results of an organisation to assess performance.

A change to the budget can be allowed in some circumstances but these must be carefully controlled if abuse is to be prevented.

Allow budget revisions when something has happened that is beyond the control of the organisation (for e.g. a supplier has gone into liquidation; a rapid increase in world market prices of a particular material) which renders the original budget inappropriate for use as a performance management tool.

These adjustments should be approved by senior management who should attempt to take an objective and independent view.

Disallow budget revisions for operational issues.

Any item that is within the operational control of an organisation should not be adjusted.

This type of decision is often complicated and each case should be viewed on its merits.

The direction of any variance (adverse or favourable) is not relevant in this decision.

Syllabus D7. Performance analysis

Using Standard Costs

Variance analysis

Variance analysis may not be appropriate in modern manufacturing companies because:

1. Standard product costs apply to manufacturing environments in which quantities of an identical product are output from the production process.

   They are not suitable for manufacturing environments where products are nonstandard or are customised to customer specifications.

2. It is doubtful whether standard costing is of much value for performance setting and control in automated manufacturing environments.

   In practice, where manufacturing systems are highly automated, the rates of production output and materials consumption, are controlled by the machinery rather than the workforce.

3. Variances are the difference between actual performance and standard, measured in cost terms.

   The significance of variances for management control purposes depends on the type of standard cost used.

   For example, adverse variances with an ideal standard have a different meaning from adverse variances calculated with a current standard.

4. Standard costing and adherence to a preset standard is inconsistent with the concept of continuous improvement, which is applied within TQM and JIT environments.

5. Variance analysis is often carried out on an aggregate basis (total material usage variance, total labour efficiency variance and so on) but in a complex and constantly changing business environment more detailed information is required for effective management control.

6. Shorter product life cycles in the modern business environment mean that standard costs will need to be reviewed and updated frequently.

Factors which Influence behaviour

Behavioural aspects in budgeting

The purpose of a budgetary control system is to assist management in planning and controlling the resources of their organisation by providing appropriate control information.

The information will only be valuable, however, if it is interpreted correctly and used purposefully by managers and employees.

The correct use of control information therefore depends not only on the content of the information itself, but also on the behaviour of its recipients.

Goal congruence exists when managers working in their best interests also act in harmony with the goals of the organisation as a whole.

Behavioural problems

1. The managers who set the budget or standards are often not the managers who are then made responsible for achieving budget targets.

2. The goals of the organisation as a whole, as expressed in a budget, may not coincide with the personal aspirations of individual managers.

   This is known as **dysfunctional behaviour.**

3. When setting the budget, there may be **budgetary slack (or bias)**.

   Budget slack is a deliberate over-estimation of expenditure and/or under-estimation of revenues in the budgeting process.

   This results in meaningless variances and a budget which has no use for control purposes.

Staff Motivation and Action

Motivation and Action

Staff's acceptance of the use of variances for performance measurement, and their motivation, is likely to increase if they know they will not be held responsible for poor planning and faulty standard setting.

The theory of motivation suggests that having a clearly defined target results in better performance than having no target at all, that targets need to be accepted by the staff involved, and that more demanding targets increase motivation provided they remain accepted.

Standards and Motivation

A basic standard is one that remains unchanged for several years and is used to show trends over time. Basic standards may become increasingly easy to achieve as time passes and hence, being undemanding, may have a negative impact on motivation.

Standards that are easy to achieve will give employees little to aim at.
Ideal standards represent the outcome that can be achieved under perfect operating conditions, with no wastage, inefficiency or machine breakdowns. Since perfect operating conditions are unlikely to occur for any significant period, ideal standards will be very demanding and are unlikely to be accepted as targets by the staff involved as they are unlikely to be achieved.

Using ideal standards as targets is therefore likely to have a negative effect on employee motivation.

Current standards are based on current operating conditions and incorporate current levels of wastage, inefficiency and machine breakdown. If used as targets, current standards will not improve performance beyond its current level and their impact on motivation will be a neutral one.

Attainable standards are those that can be achieved if operating conditions conform to the best that can be practically achieved in terms of material use, efficiency and machine performance.

Attainable standards are likely to be more demanding than current standards and so will have a positive effect on employee motivation, provided that employees accept them as achievable.

Participation in setting standards

Participation in standard setting (bottom-up budgets) can be a way of achieving improvements in performance.

However, the effectiveness of participation in setting standards depends on a variety of factors, such as the type of staff involved, the attitudes of their managers, the organisation structure and culture, and the nature of the work.

Pay as a motivator

Motivation can be provided in the form of higher pay or other rewards if targets are reached or exceeded. This will only happen if employees perceive the standards set as attainable. Also, as mentioned before in Chapter 7, where rewards are linked to targets, there may be slack when setting standard costs.

JIT and TQM

Just-in-time (JIT)

The **just-in-time (JIT)** approach to conducting the activities of an organisation is often incorrectly considered to relate solely to the manufacturing environment.

In fact, just-in-time is a very broad philosophy that emphasises simplification and continuously reducing waste in each and every area of business activity.

Total quality management (TQM)

Total quality management (TQM) is an approach that seeks to improve quality and performance which will meet or exceed customer expectations.

It applies a zero defect philosophy and develops a culture of continuous improvement which focuses on meeting customers' expectations.

Where the management of an organisation is considering the implementation of a just-in-time philosophy they need to give detailed consideration to the following:

Consideration to follow

1. Employee involvement should be actively encouraged. The successful operation of just-in-time requires that workers possess a flexibility of both attitude and aptitude.
2. The fundamental requirement to ensure that the level of quality satisfies the customer.
3. A constant focus on the simplification of products and processes in order to maximise the utilisation of available resources.
4. The creation of a uniform factory load which will enable the speed of manufacture to mirror the demand of customers.
5. The minimisation of set-up times as no value is added at this point in the manufacturing process.
6. The factory layout to be adopted. The majority of factories operating just-in-time manufacturing operations have adopted a U-shaped layout of machinery.
   This layout facilitates the flow of components, thereby minimising transportation activities while maximising efficiency.
7. The operation of a 'pull' system which produces products for the time when they are required by customers.

8. The fundamental need for excellent relationships with suppliers, putting emphasis on flexibility and good communication channels.

Key features of operating in a JIT and TQM environment

Therefore, the key features of companies operating in a JIT and TQM environment can be summarised as follows

1. high level of automation
2. high levels of overheads and low levels of direct labour costs
3. customised products produced in small batches
4. low stocks
5. emphasis on quality

Syllabus E: Performance Measurement And Control

Syllabus E1. The Scope of Performance Measurement

Financial Performance Indicators

Ratio Analysis

A key aspect of performance measurement is ratio analysis. Ratios are of little use in isolation. Firms can use ratio analysis to compare

- budgets, for control purposes
- last year's figures to identify trends
- competitors' results and/or industry averages to assess performance

Measuring Profitability

1. **Sales Growth**

   Sales in current year - Sales in previous year

   Sales in previous year

   In looking at sales growth, we usually consider other factors such as inflation. Hence, we analyse sales also in real terms.

2. **Return on Capital Employed**

   Net Profit before interest and tax x 100

   Capital Employed

   The main ratio to measure profitability in an organisation is return on capital employed (ROCE).

Capital employed is defined as total assets less current liabilities or share capital and reserves plus long term capital. It represents the percentage of profit being earned on the total capital employed; and relates profit to capital invested in the business.

Capital invested in a corporate entity is only available at a cost – corporate bonds or loan stock finance generate interest payments and finance from shareholders requires either immediate payment of dividends or the expectation of higher dividends in the future.

The primary ratio measuring overall return is analysed in more detail by using secondary ratios:

- Asset turnover
- Net Profit margin – net profit before interest and tax as a percentage of sales

These two separate factors, or a combination of both, influence the return achieved by the business entity.

3. Asset Turnover

$$\frac{\textbf{Turnover}}{\textbf{Capital Employed}}$$

The asset turnover is a measure of utilisation and management efficiency.
It indicates how well the assets of a business are being used to generate sales or how effectively management have utilised the total investment in generating income.

4. Net Profit Margin

$$\frac{\textbf{Net Profit} \times 100}{\textbf{Turnover}}$$

The profit margin indicates how much of the total revenue remains to provide for taxation and to pay the providers of capital, both interest and dividends.
This return to sales can be directly affected by the management's ability to control costs and determine the most profitable sales mix.

5. Gross Profit Margin

$$\frac{\textbf{Gross Profit} \times 100}{\textbf{Turnover}}$$

Measuring Liquidity

Liquidity is the ability of an organisation to pay its debts when they fall due. There are two main measures of liquidity: -

1. the current ratio

2. the quick (or acid test) ratio

1. Current Ratio

The current ratio is expressed as:

Current assets : Current Liabilities

If current assets exceed current liabilities then the ratio will be greater than 1 and indicates that a business has sufficient current assets to cover demands from creditors. However, the speed at which stock can be converted into cash flow is such that it is not prudent to regard stock as available to cover creditors.

2. Quick (Acid Test) Ratio

This is expressed as:

Current assets – Stocks : Current Liabilities

If this ratio is 1:1 or more, then clearly the company is unlikely to have liquidity problems. If the ratio is less than 1:1 we would need to analyse the structure of current liabilities, to those falling due immediately and those due at a later date. Measures of utilisation (measures of efficiency) include:

○ Debtors collection period

○ Creditors payment period

○ Stock turnover or stock days

3. Debtors (receivables) collection period

This is a measure of management's efficiency and is expressed as:

Debtors x 365 days

Sales

This is an indicator of the effectiveness of the company's credit control systems and policy. The control of debtor days is an important element of working capital management.

4. Creditors (payables) period

The balance between debtor and creditor days is influenced by the working capital cycle. The creditor days is a measure of how much credit, on average, is taken from suppliers. It is expressed as:

$$\frac{\textbf{Creditors (trade)}}{\textbf{Purchases}} \ \textbf{x 365 days}$$

This ratio is an aid to assessing company liquidity, as an increase in creditor days is often a sign of inadequate working capital control.

5. Inventory holding period

This is expressed as:

$$\frac{\textbf{Inventory}}{\textbf{Cost of sales}} \ \textbf{x 365 days}$$

The holding period may increase because of: -

- Build-up of inventory levels as a result of increased capacity following expansion of non-current assets.
- Increasing inventory levels in response to increased demand for product.

6. Work-in-progress period

This is expressed as:

$$\frac{\textbf{Value of WIP}}{\textbf{Cost of Sales}} \ \textbf{x 365 days}$$

7. Finished goods period

It is expressed as:

$$\frac{\textbf{Value of Finished Goods}}{\textbf{Cost of Sales}} \ \textbf{x 365}$$

This is a further measure of working capital management and relates to stock turnover. Controls need to be maintained so that liquidity is not sacrificed.

Measuring Risk

Measurement of risk considers the financial risk incurred by borrowing.

1. Financial Gearing

Financial gearing can be calculated as: -

Debt x 100%

Equity

OR

Debt x 100%

Debt + Equity

If the firm has excessive debt, then the need to pay interest before dividends will increase the risks faced by shareholders if profits fall.

2. Interest Cover

Interest cover is expressed as:

Profit before interest and tax = Number of times

Interest paid

This ratio represents the number of times that interest could be paid out of profit before interest and tax.

3. Dividend Cover

This is determined by dividing profit available to equity holders by the dividend for the year.

It is expressed as:

Earnings after tax and preference dividends = Number of times
--
Ordinary dividend

This is an indication of dividend policy – whether profits tend to be distributed or reinvested.

4. Operating Gearing

Operating gearing refers to the proportion of a company's operating costs that are fixed as opposed to variable.

$$\frac{\textbf{Fixed Costs}}{\textbf{Total Costs}}$$

The higher the proportion of fixed costs, the higher the operating gearing.

Companies with high operating gearing tend to have volatile operating profits. This is because fixed costs remain the same, no matter the volume of sales.

Thus, if sales increase, operating profit increases by a larger percentage.
But if sales volume falls, operating profit falls by a larger percentage.

Generally, it is a high-risk policy to combine high financial gearing with high operating gearing. High operating gearing is common in many service industries where many operating costs are fixed.

Non-Financial Performance Indicators

Non-Financial Indicators

In recent years, the trend in performance measurement has been towards a broader view of performance, covering both financial and non-financial indicators.

The most well-known of these approaches is the balanced scorecard proposed by Kaplan and Norton, which we will be describing later.

Areas to measure should relate to an organisation's critical success factors. Critical success factors (CSFs) are performance requirements which are fundamental to an organisation's success (for example innovation in a consumer electronics company) and can usually be identified from an organisation's mission statement, objectives and strategy.

Key performance indicators (KPIs) are measurements of achievement of the chosen critical success factors. Key performance indicators should be:

- specific (i.e. measure profitability rather than 'financial performance', a term which could mean different things to different people)

- measurable (i.e. be capable of having a measure placed upon it, for example, a number of customer complaints rather than the 'level of customer satisfaction')

- relevant, in that they measure achievement of a critical success factor.

The following table demonstrates critical success factors and key performance indicators of a college training students:

perspective	**critical success factor**	**key performance indicators**
financial success	shareholder wealth	dividend yield; % increase in share price
	cashflow	actual vs budget debtor days
customer satisfaction	exam success	college pass rate vs national average premier college status tutor grading by students
	flexibility	average number of course variants per subject (eg full-time, day release, evening)
process efficiency	resource utilisation	% room occupancy average class size average tutor teaching load (days)
growth	innovation products information technology	% of sales from < 1 year old number of online enrolments

Short-Termism and Financial Manipulation

Short-termism

Short-termism is when there is a bias towards short-term rather than long-term performance. Managers may manipulate results especially managers' performance is measured on short-term results.

For example:

1. Postponing capital expenditure projects in order to protect short term cash flow and profits.
2. Cutting R&D expenditure to save operating costs, and so reducing the prospects for future product development.
3. Reducing quality control, to save operating costs.
4. Reducing the level of customer service, to save operating costs.
5. Cutting training costs or recruitment of new employees.
6. Postponing maintenance of machinery to later years.

Steps should be taken to encourage managers to take a long-term view

- Making short-term targets realistic.
- Providing sufficient management information to allow managers to see what trade-offs they are making. Managers must be kept aware of long-term aims as well as shorter-term (budget) targets.
- Evaluating managers' performance in terms of contribution to long-term as well as shorter objectives.
- Link managers' rewards to share price.
- Set quality based targets as well as financial targets.

Balanced Score card and Building Block

The Balanced Scorecard

The **Balanced Scorecard** was popularised by Robert Kaplan and David Norton in 1992. The rationale for the development of the Balanced Scorecard was a growing dissatisfaction with traditional, financial measures of performance.

The balanced scorecard approach emphasises the need to provide management with a set of information which covers all relevant areas of performance in an objective and unbiased fashion.

The scorecard designed by Kaplan and Norton contains four key groupings of performance measures.

These four groupings, called ‘perspectives’ by Kaplan and Norton, were considered sufficient to track the key drivers of both current and future financial performance of the firm.

The perspectives focused on the achievements of the firm in four areas:

1. The **financial perspective**

   - concentrates on how the firm appears to its shareholders and considers what the firm’s financial objectives are.

   The measures used to assess whether these objectives are being achieved typically include, profit, sales, ROI, cash flow or economic value added (EVA).

2. The **customer perspective**

   - focuses on the question, what must the firm do to satisfy its customers so as to achieve its financial objectives?

   Outcome measures for the customer perspective generally include measures of customer satisfaction, market share, customer retention and customer profitability. These outcome measures can be sub-divided into driver measures, such as measures relating to lead times, on-time delivery, product quality and product cost.

3. The **internal business perspective**

   - considers the question, what must the firm do well internally in order to support the product/market strategy and to achieve its financial objectives?

Typical outcome measures include those relating to innovation (product and process) and operations (cycle times, defect rates).

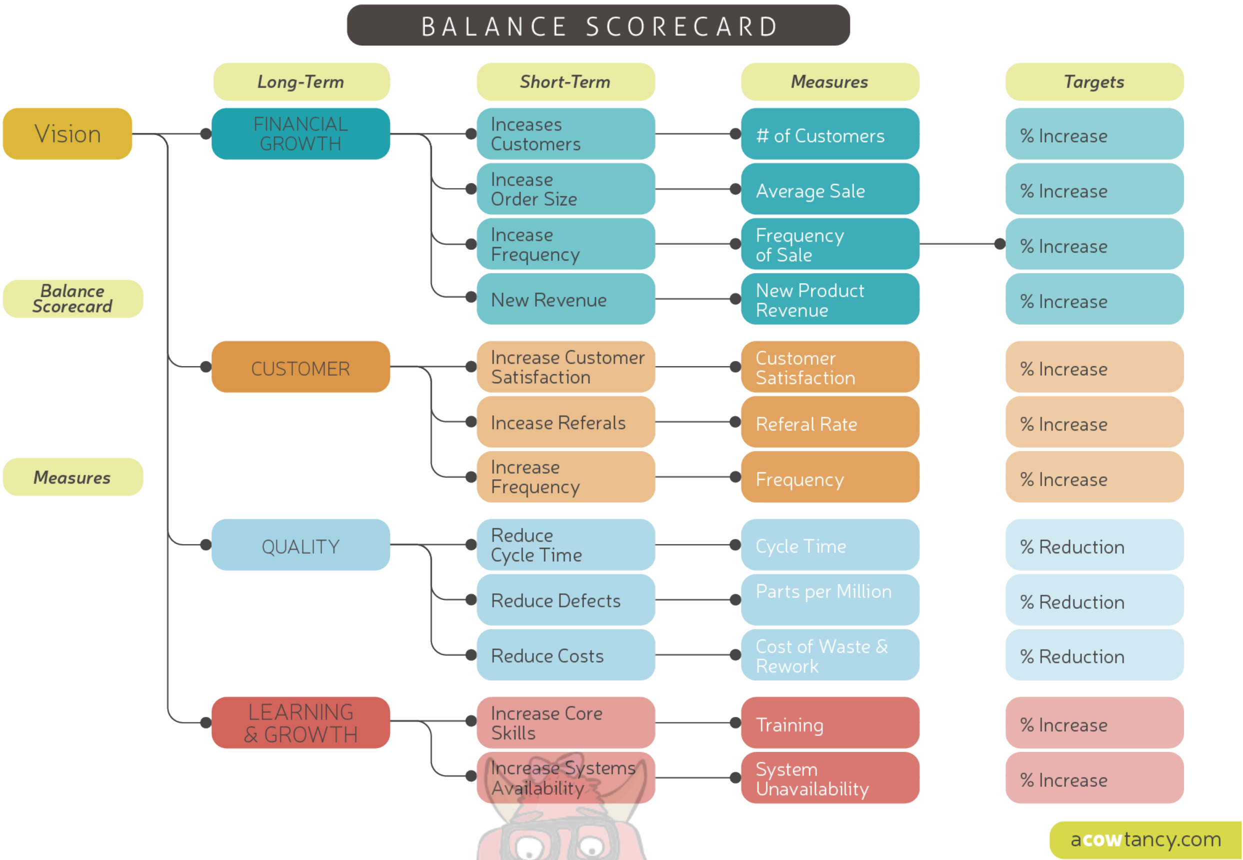
4. In the **learning and growth perspective**

   - the measures focus on the question what infrastructure must the firm build to create long-term growth and improvement?

   In other words, what capabilities must be improved or acquired to achieve the long-term targets for the customer and internal business process perspectives? Outcome measures may include metrics on employee satisfaction, training and retention.

perspective	question	explanation
customer	what do existing and new customers value from us?	gives rise to targets that matter to customers : cost, quality, delivery, inspection, handling and more.
internal	what processes must we excel at to achieve our financial and customer objectives?	aims to improve internal processes and decision making.
innovation and learning	can we continue to improve and create future value?	considers the business's capacity to maintain its competitive position through the acquisition of new skills and the development of new products.
financial	how do we create value for our shareholders?	covers traditional measures such as growth, profitability and shareholder value but set through talking to the shareholder or shareholders direct.

The following is an example of a balanced scorecard



Advantages

The balanced scorecard approach to performance measurement offers several **advantages**:

1. it measures performance in a variety of ways, rather than relying on one figure
2. managers are unlikely to be able to distort the performance measure - bad performance is difficult to hide if multiple performance measures are used
3. it takes a long-term perspective of business performance
4. success in the four key areas should lead to the long-term success of the organisation
5. it is flexible - what is measured can be changed over time to reflect changing priorities
6. 'what gets measured gets done' - if managers know they are being appraised on various aspects of performance they will pay attention to these areas, rather than simply paying 'lip service' to them.

The main difficulty with the balanced scorecard approach is setting standards for each of the KPIs. This can prove difficult where the organisation has no previous experience of performance measurement. Benchmarking with other organisations is a possible solution to this problem.

The Building Block Model

Fitzgerald & Moon (1996) consider performance measurement in service businesses. Their work attempts to overcome the problems associated with performance measurement of service businesses.

The following characteristics of service distinguish them from goods:

- **Inseparability/Simultaneity** (production and consumption of the service coinciding)

  Services often cannot be separated off the provider, for example having dental treatment.

- **Perishability** (the inability to store the service)

  The services of a doctor exist only for periods of time.

  If they are not consumed, they 'perish'. They cannot be used later.

- **Heterogeneity** (lack of consistency)

  Variability of quality occurs because of the large number of variables involved. The quality of the service may depend on who it is that delivers the service. (e.g. hairdresser)

- **Intangibility** (of what is provided to and valued by individual customers)

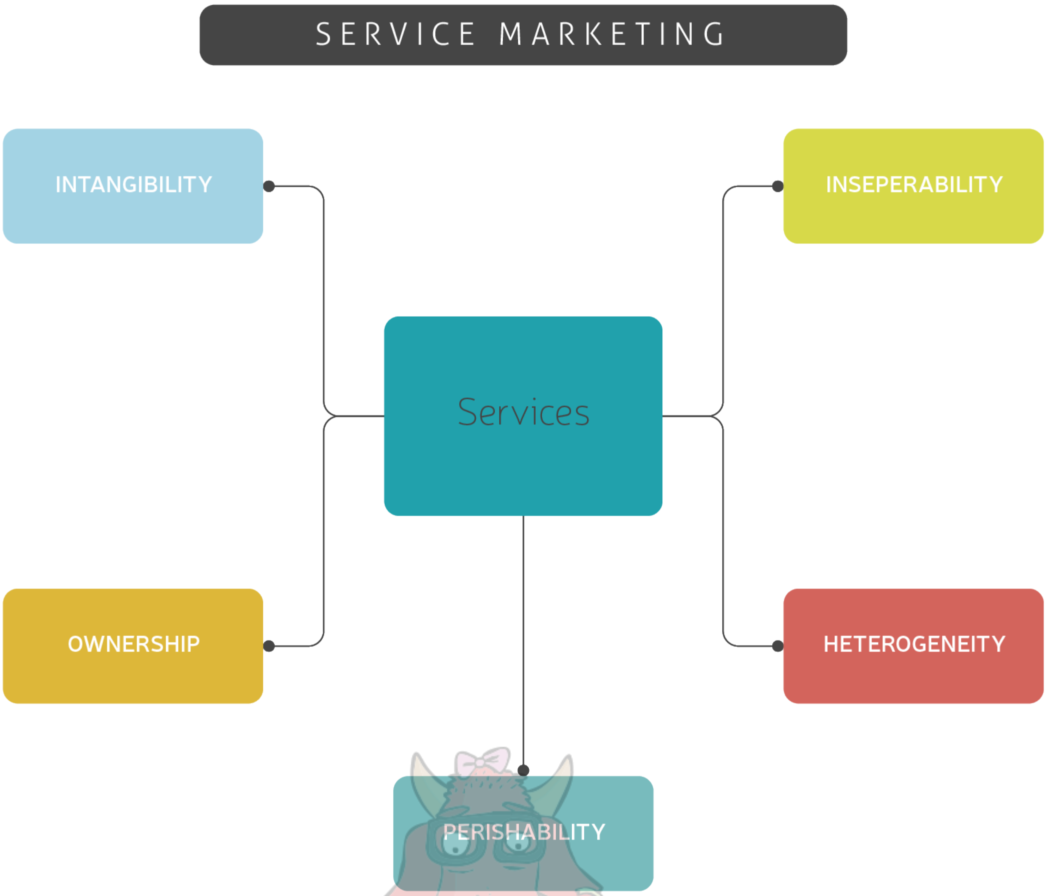
  Intangibility refers to the **lack of substance** which is involved with service delivery.

  Unlike goods, there is no physical aspects to a service - no taste, feel, visible presence.

- **Ownership**

  Services do not result in the transfer of property.

  The purchase of a service only gives the customer access to or the right to use a facility, not ownership.



Dimensions

Dimensions an be divided into two sets: -

- The results, measured by financial performance (profitability, capital structure) and competitiveness (sales growth, market share)
- The determinants (what determines competitive and financial performance): -

  1. Quality of service

  2. Flexibility

  3. Resource utilisation

  4. Innovation

1. Standards

These are ownership, achievability and equity.

1. Employees need to participate in the budget and standard-setting processes. They are then more likely to accept the standards.

2. Standards need to be set high enough to ensure that there is some sense of achievement in attaining them, but not so high that there is a demotivating effect because they are unachievable.

3. Equity is seen to occur when applying standards for performance measurement purposes.

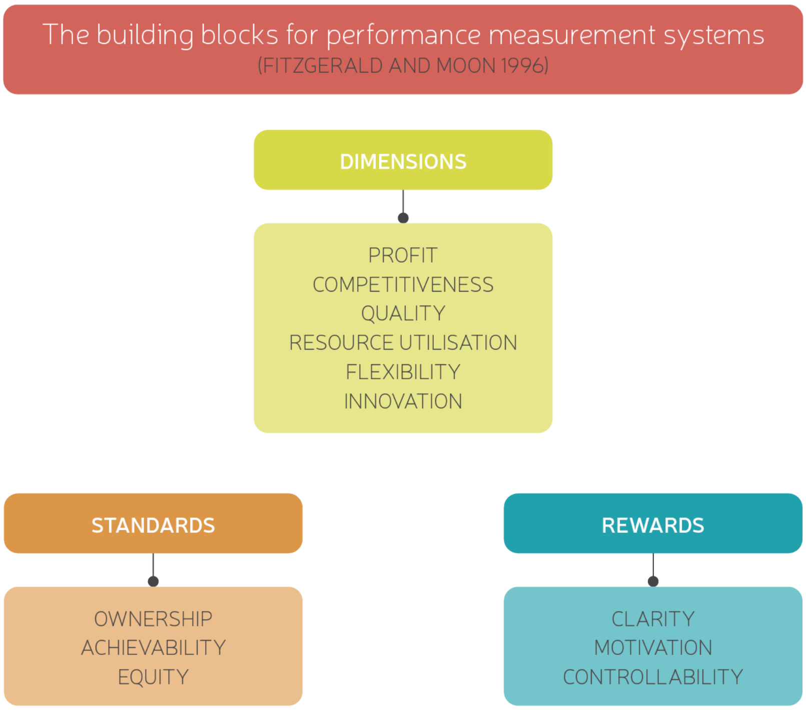
2. Rewards

If the performance measurement system is to operate successfully; clarity, motivation and controllability are required.

1. Objectives need to be clearly understood by those whose performance is being appraised.

2. Individuals should be motivated to work in pursuit of the organisation's strategic objectives.

3. Managers should be accountable for their areas of responsibility. For example they should not be held responsible for costs over which they have no control.



How to answer Performance Measurement questions

- Present calculations in a referenced list.
- Don’t consider any one piece of information or number in isolation.
- Use headings wherever possible and avoid writing ‘a sea of words’.
- When you are writing a statement, e.g. ‘sales have increased by 1.3%’ always ask yourself the question ‘why do I care?’. This will help you make a meaningful point and take a thought through to its logical conclusion.
- Read all the requirements and make sure that you don’t start talking about, e.g. requirement (b) in requirement (a), as you will then find that you have nothing to say when you get to requirement (b).
- Use the marks available as a guide as to how much to write. There are no set marking rules such as ‘one mark per valid point’. Marks vary from question to question.

Syllabus E2. Divisional Performance and Transfer Pricing

Transfer Pricing

Transfer Pricing

Transfer pricing is used when divisions of an organisation need to charge other divisions of the same organisation for goods and services they provide to them.

Usually, each division will report its performance separately. Hence, some monetary value must be allocated to record the transfer of these goods or services.

For example, division A might make a component that is used as part of a product made by division B of the same company, but that can also be sold to the external market, including makers of rival products to division B's product.

There will therefore be two sources of revenue for A.

1. **External sales revenue** from sales made to other organisations, valued at the selling price.

2. **Internal sales revenue** from sales made to other responsibility centres within the same organisation, valued at the transfer price.

Multinational transfer pricing is the process of deciding on appropriate prices for the goods and services sold intra-group across national borders.

When considering a multinational firm, additional objectives are to:

1. Pay lower taxes, duties, and tariffs

   Be aware that multinational firms will be keen to transfer profits if possible from high tax countries to low tax ones.

2. Repatriate funds from foreign subsidiary companies to head office
3. Be less exposed to foreign exchange risks
4. Build and maintain a better international competitive position
5. Enable foreign subsidiaries to match or undercut local competitors’ prices
6. have good relations with governments in the countries in which the multinational firm operates

Transfer pricing is not simply buying and selling products between divisions.

The term is also used to cover:

1. head office general management charges to subsidiaries for various services
2. specific charges made to subsidiaries by, for example, head office human resource or information technology functions
3. royalty payments

   – between parent company and subsidiaries

   – among subsidiaries.

4. interest rate on borrowings between group companies.

Ethical issues in transfer pricing

There are a number of potential ethical issues for the multinational company to consider when formulating its transfer pricing strategy:

- Social responsibility, reducing amounts paid in customs duties and tax.

- Bypassing a country's financial regulation via remittance of dividends.

- Not operating as a 'responsible citizen' in foreign country.

- Reputational loss.
- Bad publicity.

- Tax evasion.

Good transfer price

A good transfer price should have the following characteristics (objectives):

1. **Preserve divisional autonomy:**

   almost inevitably, divisionalisation is accompanied by a degree of decentralisation in decision making so that specific managers and teams are put in charge of each division and must run it to the best of their ability.

   Divisional managers are therefore likely to resent being told by head office which products they should make and sell.

   Ideally, divisions should be given a simple, understandable objective such as maximising divisional profit.

2. **Maintain motivation for managers**

   Be perceived as being fair for the purposes of performance evaluation and investment decisions.

3. **Assess divisional performance objectively**

   Permit each division to make a profit:

   profits are motivating and allow divisional performance to be measured using positive ROI or positive RI

4. **Ensure goal congruence**

   Encourage divisions to make decisions which maximise group profits:

   the transfer price will achieve this if the decisions which maximise divisional profit also happen to maximise group profit

– this is known as goal congruence. Furthermore, all divisions must want to do the same thing.

There’s no point transferring out if the next division doesn’t want to transfer in.
In practice it is difficult to achieve all four aims.

Potential benefits of operating a transfer pricing system within a divisionalised company include the following:

1. Leads to **goal congruence** - motivates divisional managers to make decisions, which improve divisional profit and improve profit of the organisation as a whole.

2. Hence it prevents **dysfunctional decision making**.

3. Transfer prices set at a level that enables divisional performance to be measured **'commercially'**.

4. **Divisional autonomy** - A good transfer pricing system helps to ensure that a balance is kept between divisional autonomy to provide incentives and motivation, and centralised authority to ensure that the divisions are all working towards the same goals of the organisation.

Practical Transfer Pricing

Transfer prices are set using the following techniques:

- Market prices

- Production cost – this can be based on variable or full cost including a mark-up

- Negotiation

The Use of Market Prices as a basis of Transfer Pricing

If an external market price exists for transferred goods, profit centre managers will be aware of the price they could obtain or the price they would have to pay for their goods on the external market, and they would inevitably compare this price with the transfer price.

The Merits of Market Value Transfer Prices

1. **Divisional autonomy**

   A transferor division should be given the freedom to sell output on the open market, rather than to transfer it within the company.

   'Arm's length' transfer prices, which give profit centre managers the freedom to negotiate prices with other profit centres as though they were independent companies, will tend to result in a market-based transfer price.

2. Corporate profit maximisation

In most cases where the transfer price is at market price, internal transfers should be expected, because the buying division is likely to benefit from a better quality of service, greater flexibility, and dependability of supply.

Both divisions may benefit from cheaper costs of administration, selling and transport.

A market price as the transfer price would therefore result in decisions which would be in the best interests of the company or group as a whole.

3. Divisional performance measurement

Where a market price exists, but the transfer price is a different amount (say, at standard cost plus), divisional managers will argue about the volume of internal transfers.

For example, if division X is expected to sell output to division Y at a transfer price of $8 per unit when the open market price is $10, its manager will decide to sell all output on the open market.

The manager of division Y would resent the loss of his cheap supply from X, and would be reluctant to buy on the open market.

A wasteful situation would arise where X sells on the open market at $10, where Y buys at $10, so that administration, selling and distribution costs would have been saved if X had sold directly to Y at $10, the market price.

The disadvantages of market value transfer prices

1. The market price may be a temporary one, induced by adverse economic conditions, or dumping, or the market price might depend on the volume of output supplied to the external market by the profit centre.
2. A transfer price at market value might, under some circumstances, act as a disincentive to use up any spare capacity in the divisions.
   A price based on incremental cost, in contrast, might provide an incentive to use up the spare resources in order to provide a marginal contribution to profit.
3. Many products do not have an equivalent market price so that the price of a similar, but not identical, product might have to be chosen.
   In such circumstances, the option to sell or buy on the open market does not really exist.
4. There might be an imperfect external market for the transferred item, so that if the transferring division tried to sell more externally, it would have to reduce its selling price.

Cost-Based Transfer Prices

Transfer prices based on variable/marginal cost

A variable cost approach entails charging the variable cost (equal to marginal cost) that has been incurred by the supplying division to the receiving division.

The problem is that with a transfer price at marginal cost, the supplying division does not cover its fixed costs.

Drawbacks when transfer prices are based on variable/marginal cost

Although good economic decisions are likely to result, a transfer price equal to marginal cost has certain drawbacks:

- Selling division will make a loss as its fixed costs cannot be covered.
  This is demotivating.
- Performance measurement is distorted. Selling division is condemned to making losses while buying division gets an easy ride as it is not charged enough to cover all costs of manufacture.
  This effect can also distort investment decisions made in each division. For example, buying division will enjoy inflated cash inflows.
- There is little incentive for selling division to be efficient if all marginal costs are covered by the transfer price.
  Inefficiencies in selling division will be passed up to buying division.
  Therefore, if marginal cost is going to be used as a transfer price, at least make it standard marginal cost, so that efficiencies and inefficiencies stay within the divisions responsible for them.

Approaches to transfer pricing

There are two approaches to transfer pricing which try to preserve the economic information inherent in variable costs while permitting the transferring division to make profits, and allowing better performance valuation.

- Variable cost plus lump sum: transfers are made at variable cost but, periodically, a transfer is made between the two divisions to account for fixed costs and profit.

- Dual pricing: In this approach, the supplying division transfers out at cost plus a mark up and the receiving division transfers in at variable cost.

  Obviously, the divisional current accounts won’t agree, and some period-end adjustments will be needed to reconcile those and eliminate fictitious interdivisional profits.

Transfer prices based on full cost

Under this approach, the full cost (including fixed overheads absorbed) incurred by the supplying division in making the 'intermediate' product is charged to the receiving division.

The drawback to this is that the division supplying the product makes no profit on its work so is not motivated to supply internally.

If a full cost plus approach is used, a profit margin is also included in this transfer price.

The supplying division will therefore gain some profit at the expense of the buying division.

Actual cost versus standard cost

When a transfer price is based on cost, standard cost should be used, not actual cost. A transfer at actual cost would give the supplying division no incentive to control costs because all of the costs could be passed on to the receiving division.

Actual cost-plus transfer prices might even encourage the manager of the supplying division to overspend, because this would increase divisional profit, even though the organisation as a whole suffers.

Standard cost-based transfer prices should encourage the supplying division to become more efficient.

The problem with this approach is that it penalises the supplying division if the standard cost is unattainable, while it penalises the receiving division if it is too easily attainable.

Negotiated Transfer Prices

In some cases, the divisions of a company are free to negotiate the transfer price between themselves and then to decide whether to buy and sell internally or deal with outside parties.

Negotiated transfer prices are often employed when market prices are volatile and change occurs constantly.

The negotiated transfer price is the outcome of a bargaining process between the supplying and receiving division.

Which is the optimal transfer price?

Minimum (fixed by the supplying division):

Transfer price ≥ variable cost of supplying division + any lost contribution

Maximum (fixed by receiving division):

Transfer price ≤ the lower of net marginal revenue of the receiving division and the external purchase price

When unit variable costs and/or unit selling prices are not constant, there will be a profit-maximising level of output and the ideal transfer price will only be found by negotiation and careful analysis: -

1. Establish the output and sales quantities that will optimise the profits of the company or group as a whole.

2. Establish the transfer price at which both profit centres would maximise their profits at this company-optimising output level.

   There may be a range of prices within which both profit centres can agree on the output level that would maximise their individual profits and the profits of the company as a whole.

   Any price within the range would then be ‘ideal'.

ROI and RI

Measures of divisional performance

Decentralisation is the delegation of decision-making to lower levels of management.

One disadvantage of decentralisation is that managers may make decisions that are not in the best interests of the overall company (dysfunctional decisions).

Hence, senior managers need to introduce systems of performance measurement to ensure that decisions made by junior managers are in the best interests of the company as a whole.

In an investment centre, managers have the responsibilities of a profit centre plus responsibility for capital investment. Two measures of divisional performance are commonly used:

1. Return on investment (ROI)

   controllable (traceable) profit %
   ----
   controllable (traceable) investment

2. Residual income
   controllable (traceable) profit - an imputed interest charge on controllable (traceable) investment.

Relative merits of ROI and Residual Income

Return on investment is a relative measure and hence suffers accordingly. For example, assume you could borrow unlimited amounts of money from the bank at a cost of 10% per annum.

Would you rather borrow $100 and invest it at a 25% rate of return or borrow $1m and invest it at a rate of return of 15%?

Although the smaller investment has the higher percentage rate of return, it would only give you an absolute net return (residual income) of $15 per annum after borrowing costs.

The bigger investment would give a net return of $50,000. Residual income, being an absolute measure, would lead you to select the project that maximises your wealth.

Residual income also ties in with net present value, theoretically the best way to make investment decisions. In the long run, companies that maximise residual income will also maximise net present value and in turn shareholder wealth.

Residual income does, however, experience problems in comparing managerial performance in divisions of different sizes. The manager of the larger division will generally show a higher residual income because of the size of the division rather than superior managerial performance.

Problems common to both ROI and Residual Income

The following problems are common to both measures

1. Identifying controllable (traceable) profits and investment can be difficult.

2. If used in a short-term way they can both over-emphasise short-term performance at the expense of long-term performance. Investment projects with positive net present value can show poor ROI and residual income figures in early years leading to rejection of projects by managers.

3. If assets are valued at net book value, ROI and residual income figures generally improve as assets get older. This can encourage managers to retain outdated plant and machinery.

4. Both techniques attempt to measure divisional performance in a single figure. Given the complex nature of modern businesses, multi-faceted measures of performance are necessary.

5. Both measures require an estimate of the cost of capital, a figure which can be difficult to calculate.

Syllabus E3. Not for Profit Organisations & Public Sector

Problems of having non-quantifiable objectives

Not-for-profit organisation

Its first objective is to be involved in non-loss operations to cover its costs

For example:

1. charities
2. statutory bodies offering public transport or the provision of services such as leisure, health or public utilities such as water or road maintenance.

Objectives for not-for-profit organisations

A major problem with many not-for-profit organisations, particularly government bodies, is that it is extremely difficult to define their objectives at all.

NFP objectives include:

- Surplus maximisation (equivalent to profit maximisation)
- Revenue maximisation (as for a commercial business)
- Producer satisfaction maximisation (satisfying the wants of staff and volunteers)
- Client satisfaction maximisation (the police generating the support of the public)

It is also difficult to measure the performance of not-for-profit organisations.

As already said, it is sometimes very difficult to define their objective at all, let alone try to measure their performance.

Example of NFP

One of the objectives of the local council could be 'to provide adequate street lighting throughout the area'.

Its other objective could be to improve road safety.

- How could the 'adequacy' of street lighting be measured?

- What is the amount of money to pay for adequately lit streets and improved road safety?

Without information about what is being achieved (outputs) and what it is costing (inputs), it is impossible to make efficient resource allocations.

These allocation decisions rely on a range of performance measures which, if unavailable, may lead managers to allocate resources based on subjective judgment.

Without performance measures, managers will not know the extent to which operations are contributing to effectiveness and efficiency; when diagnostic interventions are necessary; how the performance of their organisation compares with similar units elsewhere; and how their performance has changed over time.

Government may require performance information to decide how much to spend in the public sector and where, within the sector, it should be allocated.

In particular they will be interested to know what results may be achieved as a consequence of a particular level of funding, or to decide whether or not a service could be delivered more effectively and efficiently in the private sector.

Likewise people who provide funds for other kinds of not-for-profit organisations are entitled to know whether their money is being put to good use.

Multiple Objectives

Objectives of Not-for-profit organisations

Not-for-profit organisations have multiple stakeholders. This gives rise to multiple objectives. Organisations will need to prioritise/compromise as, very often, it is impossible to say which is the overriding objective.

Unlike commercial organisations, public sector organisations are subject to strong political influences. For example, a decision to close a local hospital in an effort to save costs is likely to be less acceptable to the public than the closure of a factory for the same reason.

There are other problems with performance measurement of not-for-profit organisations:

1. ***Measuring outputs***

   Outputs can seldom be measured in a way that is generally agreed to be meaningful.

   Do good exam results alone indicate good quality teaching?

2. ***Lack of profit measures***

   If an organisation is not expected to make a profit or has no sales, are indicators such as ROI and RI meaningful?

3. ***Nature of service provided***

   Many not-for-profit organisations provide services for which it is difficult to provide a cost unit.

   What is the cost unit for the local council?

4. ***Financial constraints***

   Financial constraints are more pronounced in not-for-profit organisations.

   Raising finance by a local authority is subject to strict control by central government.

5. Political, social and legal influences

Public sector organisations are subject to strong political influences.

The public may have higher expectations of these organisations.

They are subject to more legal requirements.

Performance Measurement in NFP

Performance Measure

Performance is judged in terms of inputs and outputs and hence the value for money criteria of economy, efficiency and effectiveness.

- Effectiveness is the relationship between an organisation's outputs and its objectives.

  It ensures that the outputs of a service or programme succeed in achieving objectives.

- Efficiency is the relationship between inputs and outputs.

  It is concerned with maximising output for a given input.

- Economy is attaining the appropriate quantity and quality of inputs at lowest cost.

  Therefore, economy is concerned with the cost of inputs.

Public sector organisations are now under considerable pressure to prove that they operate economically, efficiently and effectively, and are encouraged from many sources to draw up action plans to achieve value for money as part of the continuing process of good management.

Value for Money (VFM)

Indicators to assess overall performance

1. Effectiveness

1. Financial indicators

- Quality of service/output measures; e.g. exam results; pupil/teacher ratio
- Utilisation of resources; e.g. hospital bed occupancy; are trained teachers fully used to teach the subjects they have been trained for?
- Flexibility; e.g. average waiting time

2. Non-financial indicators

- Workplace morale
- Staff attitude to dealing with the public
- Client satisfaction in the service being provided

2. Efficiency

Financial indicators to measure efficiency

- Cost per unit of activity (e.g. cost per student)
- Variance analysis
- Comparisons with benchmark information
- Cost component as a proportion of total costs
- Costs recovered as a proportion of costs incurred (eg payment received from householders requesting collection of bulky/unusual items of refuse)

3. Economy

A-value-for-money (VFM) audit will look also at the economy of the use of resources, for e.g. in the case of state education, it will look into the cost wages of school teachers, the cost of books, equipment.

Interpret NFPIs

Interpret NFPIs

The use of non-financial performance indicators are an additional tool to monitor performance in not-for-profit organisations.

For example, if the case of a secondary school, some non-financial performance indicators about the performance of the school would be:

- The number of pupils taught
- The number of subjects taught per pupil
- How many examination papers are taken
- The pass rate
- The proportion of students which go on to further education

Let's take a bus service which is non-profit seeking

In fact, its mission is to provide reliable and affordable public transport to the citizens.

It often involves operating services that would be considered uneconomic by the private sector bus companies.

Let's have a look at some non-financial performance indicators for the public bus service:

Non-financial performance indicator	Importance
% of buses on time	Punctuality is important to passengers
% of buses cancelled	Reliability is important to passengers
Customer rating of cleanliness of facilities	Passengers require good quality service
% of new customers	New customers are vital for sustained growth
Employee morale	Happy employees are vital for success in a service business

In not-for-profit organisations, decisions may be taken to improve short-term performance but may have a negative impact on long-term performance.

This will have limited benefit to the organisation as it will not convey the full picture regarding the factors that will drive the achievement of objectives e.g. customer satisfaction, quality of service.

Results may be manipulated to show a better picture but the effect on stakeholders will be negative.

Let’s take an example.

The hospital tends to manipulate its results with respect to waiting times for operations.

Obviously, citizens will be disappointed and start losing trust in the organisation.

Example 1

Cowsville is a town with a population of 100,000 people.

The town council of Cowsville operates a bus service which links all parts of the town with the town centre.

The service is non-profit seeking and its mission statement is ‘to provide efficient, reliable and affordable public transport to all the citizens of Cowsville.’

Attempting to achieve this mission often involves operating services that would be considered uneconomic by private sector bus companies, due either to the small number of passengers travelling on some routes or the low fares charged.

The majority of the town council members are happy with this situation as they wish to reduce traffic congestion and air pollution on Cowsville’s roads by encouraging people to travel by bus rather than by car.
However, one member of the council has recently criticised the performance of the Cowsville bus service as compared to those operated by private sector bus companies in other towns.

She has produced the following information:

Cowsville Bus Service
Summarised Income and
Expenditure Account
Year ending 31 March 2016

	US$0	US$0

Passenger fares		1,200
Staff wages	600	
Fuel	300	
Depreciation	280	
		1,180
Surplus		20

Summarised Balance Sheet as at 31 March 2016.		
	US$0	US$0
Fixed assets (net)		2,000
Current assets		
Stock	240	
Cash	30	
	270	
Less creditors due within one year	(60)	
Net current assets		210
Total assets less liabilities		2,210
Ordinary share capital (£1 shares)		2,000
Reserves		210
		2,210

Operating Statistics for the year ended 31 March 2016

Total passengers carried = 2,400,000 passengers

Total passenger miles travelled = 4,320,000 passenger miles

Private sector bus companies Industry average ratios Year ended 31 March 2016.

Return on capital employed = 10%

Return on sales (net margin) = 30%

Asset turnover =0·33 times

Average cost per passenger mile = 37·4p

Required:

(a) Calculate the following ratios for the Cowsville bus service

(i) Return on capital employed (based upon opening investment);

(ii) Return on sales (net margin);

(iii) Asset turnover;

(iv) Average cost per passenger mile.

(b) Explain the meaning of each ratio you have calculated. Discuss the performance of the Cowsville bus service using the four ratios.

Solution:

- ***(a) Ratios***

  Return on Capital employed

  Operating Profit / Capital employed x 100 = 20 / 2,210 x 100 = 0.9%

  Return on sales (net margin)

  Operating profit / Sales x 100 = 20 / 1,200 x 100 = 1.7%

  Asset Turnover

  Sales / Capital employed = 1,200 / 2,210 = 0.54 times

  Average cost per passenger mile

  Operating cost / Passenger miles = 1,180,000 / 4,320,000 = 27.3p

  Tutorial Note: the term profit is used throughout this answer; in the public sector it would normally be referred to as surplus.

- ***(b) Meaning of each ratio***

  Return on Capital employed.

  This ratio measures the profits earned on the long-term finance invested in the business. The Cowsville bus service is only generating an annual profit of 0.9p for every £1 invested. The equivalent figure for private bus companies is 10p.

Return on sales.

This ratio measures the profitability of sales. For the Cowsville bus services 1.7p of every £1 of sales is profit. The equivalent figure for private bus companies is 30p.

Asset turnover.

This ratio measures a firm’s ability to generate sales from its capital employed. The Cowsville bus service generates sale of 54p for every £1 of capital employed. The equivalent figure for private bus companies is only 33p.

Average cost per passenger mile.

This measures the cost of transporting passengers per mile travelled.
The Cowsville bus service incurs a cost of 27.3p per passenger mile as compared to 37.4p for private bus companies.

- ***Performance of the bus service***

On first sight the Cowsville bus service appears to have performed poorly as compared to private sector bus companies.

It has a low return on capital employed, largely due to a poor return on sales.
This could be explained by the low fares charged.

On the positive side its ability to generate sales is good and its buses to be more intensively used than private sector equivalents.

However, if we take into account the objectives of the council and the mission statement of the bus service it is possible to draw a different conclusion.

Private sector companies usually seek to maximise investor wealth.

The council appears to be trying to encourage usage of public transport in an attempt to reduce traffic congestion.

To do this it charges low fares, resulting in a poor return on sales and a low return on capital employed.

However, the low fares, and willingness to operate uneconomic routes has led to a high asset turnover, implying above industry average usage of the bus service.

In turn this greater usage of the service leads to a lower cost per passenger mile as fixed costs are spread more thinly over a larger number of passenger miles.

Before drawing any firm conclusions it would be sensible to compare the performance of the Cowsville bus service with that of bus operators pursuing similar objectives.

(Tutorial Note: If we compare average fare per passenger mile we can see that the Cowsville bus service charges lower fares than the private sector.

Cowsville fare per passenger mile = passenger fares ÷ passenger miles
= £1,200,000 ÷ 4,320,000 = 27.8p

Private sector = Average cost ÷ (1 - net margin)
= 37.4p ÷ (1 – 0.3) = 53.4p

Cowsville charges lower fares per passenger mile. Which may explain its higher load factor and therefore its lower cost per passenger mile)

Syllabus E4. External Considerations & Behavioural Aspects

The need for allowing external consideration

Performance management needs to allow for external considerations including stakeholders, market conditions and allowance for competitors.

Stakeholders

Stakeholders are groups of people or individuals who have a legitimate interest in the activities of an organisation. They include customers, employees, the community, shareholders, suppliers and lenders.

There are three broad types of stakeholder in an organisation.

- **Internal** stakeholders (employees, management)
- **Connected** stakeholders (shareholders, customers, suppliers, financiers)
- **External** stakeholders (the community, government, pressure groups)

The stakeholder approach suggests that corporate objectives are, or should be, shaped and influenced by those who have sufficient involvement or interest in the organisation's operational activities.

The objectives of the employees and management are likely to have a strong influence on how an organisation is run. They are interested in the organisation's continued existence. They have individual interests and goals which can be harnessed to the goals of the organisation.

Connected stakeholders are interested in increasing shareholder value. If management performance is measured and rewarded by reference to changes in shareholder value then shareholders will be happy, because managers are likely to encourage long-term share price growth.

External stakeholder groups – the government, local authorities, pressure groups, the community at large, professional bodies – are likely to have quite diverse objectives. The government is interested in creating jobs, providing training, and collecting tax. External stakeholders in particular induce social and ethical obligations.

Market conditions

This would consider such factors as economic growth, inflation, interest rates, exchange rates, government fiscal policy.

Competition

Performance management must consider information on competitors’ prices and cost structures. It must identify which features of an organisation’s products add value. Hence, management can react quickly and effectively to changing market conditions.

Interpretation of performance

Performance measure

Organisations may need to develop performance measures to ensure that the needs of stakeholders are met.

Examples of performance measures would be

- Employees: - Employees Morale index, Retail price index
- Management: - Salary, Share options
- Shareholders: -Share price, dividend yield, Earnings per share
- Customer: - Price, Quality, Service
- Government: - Taxation, Inflation, Exports, Employment,
- Community: - Salary, Employment, Pollution, Congestion